MAN AND THE BIOSPHERE PROGRAM

HEARING

BEFORE THE

SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

NINETY-EIGHTH CONGRESS

FIRST SESSION

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MAN AND THE BIOSPHERE PROGRAM

APRIL 5, 1983

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON NATURAL RESOURCES,
AGRICULTURE RESEARCH AND ENVIRONMENT,
Washington, D.C.

The subcommittee met, pursuant to call, at 2:14 p.m. in room 2318, Rayburn House Office Building, Hon. Buddy MacKay presiding.

Staff present: Jim Greene, science consultant and Mary Beth McJury, minority technical consultant.

Mr. MACKAY. I would like to apologize for the delay in opening the meeting. Another subcommittee of the Science and Technology Committee is meeting and having a very important series of votes right now, and the memberships in the two subcommittees overlap.

I have delayed the meeting until we could have a Republican member. We are now in business.

The Subcommittee on Natural Resources, Agriculture Research and Environment will come to order.

Today's oversight hearing will examine the U.S. man and the biosphere program, known as the MAB program. The United States was instrumental in the establishment of the MAB program in 1971 and has been a major participant since that time.

MAB has been acknowledged to be a productive, cost-effective program and has been singled out by the United Nations Educational, Scientific and Cultural Organization, UNESCO, as a model to be followed by other international programs.

Despite this apparent success, the Federal Government has requested no program funding for fiscal year 1984. Therefore, it is appropriate that the subcommittee examine the program's accomplishments in order to determine if the decision to eliminate the U.S. MAB program is justified. Such decisions will have wide national and international impacts. Examples from my own State of Florida will illustrate this point.

Past MAB activities have included studies in the impact of chemical industries on marine life productivity in the Apalachicola River Valley and Apalachee Bay in Florida. Another important MAB study examined methods for restoration and management of Lake Okeechobee, the Big Cypress Swamp, and the Everglades.

On the international level, the MAB program has had an impact on Florida. Our State has borne the brunt of immigrants from the Caribbean, especially Haiti. Some of you may have read that another boat load of Haitian immigrants was intercepted yesterday at the coast of Florida.

One of the causes of this human migration has been the devastating destruction of the tropical forests and ecosystems which rendered Haiti's agricultural resources incapable of supporting the population.

Research and study programs such as MAB have contributed in the past and could provide the assistance necessary to resolve these environmental problems, thereby encouraging self-sustainability. Thus, the program has had a significant impact on Florida and the long-range benefits could be even greater.

This hearing will provide more examples of MAB activities both on the national and international levels and should provide the information necessary to allow the subcommittee to evaluate the U.S. MAB program and make recommendations regarding its future.

We will hear, this afternoon, testimony from Federal officials on the U.S. MAB program and from scientists who direct various research efforts. Finally, we will hear from witnesses from the Natural Resources Defense Council and the National Wildlife Federation.

I would like to recognize my colleague from New York, the ranking minority member of the subcommittee, Mr. McGrath, for any statement he might wish to make.

Mr. MCGRATH. Thank you, Mr. MacKay. I would just like to welcome to the subcommittee this afternoon our distinguished panels of witnesses.

It seems to me that for a paltry $60,000, we are getting overly exercised here. I don't understand what the objection of OMB would be to an allocation of that amount of money to a program that seemingly has as much benefit as the MAB program.

So I am glad to have you here so that we can build a case for you and transfer that case to the Foreign Affairs Committee where I am sure this will receive more than adequate consideration.

Mr. MACKAY. Thank you, Mr. McGrath.

Mr. Valentine, do you have any opening comments?

Mr. VALENTINE. I have none.

Mr. MACKAY. Thank you. I am glad you are here.

Mr. Chandler.

Mr. CHANDLER. No. Thank you.

Mr. MACKAY. Our first witness will be Mr. James Phillips from the Department of State.

Mr. Phillips, if you would introduce the gentleman with you for the record and then we would be pleased to have any summary remarks you would care to make. Your full statement will be a part of the committee record.

STATEMENTS OF JAMES D. PHILLIPS, DEPARTMENT OF STATE, AND BROOKE HOLMES, ACTING EXECUTIVE DIRECTOR, U.S. MAB PROGRAM

Mr. PHILLIPS. Thank you very much, Mr. Chairman. It is a great pleasure to be here today to testify before this committee. My colleague is Mr. Brooke Holmes, also of the Department of State, who has been directly responsible for administering the MAB program in the Department of State during the past year.

I do have a prepared statement, which I am glad to hear will be submitted for the record, and I would summarize my remarks.

I will also address briefly the question of the financial implications of the MAB program and some of the things that we proposed because I can see that that is much on the committee's mind, and I think that it is a subject of some slight confusion, which perhaps I can clear up.

Before that, let me begin by saying that the MAB program is a UNESCO program. It was established in 1971 as a successor to another UNESCO program called the international biological program.

Now, the MAB program was designed to meet a need that was seen internationally for an interdisciplinary program which would attempt to take a problem-solving approach to environmental and natural resource issues.

In 1971 these issues were coming to the forefront of the minds of many people around the world. It was felt that some sort of coordination of efforts was necessary and UNESCO undertook this program largely in response to U.S. initiative.

MAB set itself 14 different program areas in which it would foster international cooperation and individual research. Of these 14 areas, seven are directly focused on geographic phenomenon, such as forests, arid lands, coastal zones, mountains, and so on.

Six focus on systems or processes; demographic changes, for example, urban ecosystems, the uses of pesticide in the environment.

One program is very special. It is called the biosphere reserve program. It calls for countries, either individually or in cooperation with other countries, to set aside reserves which would be totally protected and which would serve as test tube cases for research and monitoring on conservation questions.

Those are the areas that MAB deals with. By late 1982, there was some 1,000 field projects in place, some 10,000 researchers associated with MAB programs around the world, representing some 80 countries.

In the United States alone, over 800 American scientists have been involved in one way or another with MAB programs. MAB is organized internationally. It really is a very loose alliance of member states.

There is not a great deal of headquarters activity. However, there is a small headquarters staff at UNESCO, and there is an international coordinating council at UNESCO. Dr. Paul Baker, who you will hear from very shortly, is the vice chairman of that international council, and represents the United States at UNESCO headquarters when the council meets.

The United States has participated in MAB since 1972. It was originally set up as part of the U.S. National Commission for UNESCO.

Within the United States there are some 12 directorates around the country which consist of scientists who come together from time to time, to consider research projects, to plan conferences, to participate in workshops, and to foster international exchanges with their counterparts around the world.

There is also a small MAB secretariate in the State Department which consists of three part-time Government employees.

Then there is the U.S. National Committee for MAB, which is, again, a committee consisting of prominent researchers and scientists in MAB-related activities who provide overall policy advice and guidance.

As you can see, one of the great advantages of MAB is a very small staff that the Government needs to see that its efforts are coordinated. When we speak of three part-time Government employees, that is really all of the resources that we have devoted to MAB in the Department of State this year.

In past years it has been larger than that, but never much larger than that because one of the great advantages of MAB is that it relies on a great deal of private sector initiative, of voluntarism, of people giving their time to projects which are of interest to them and requires a minimum of Government involvement, coordination or supervision.

We really are there to kind of help them get organized, and that is about it.

So that is one of the great advantages we see in the program, is that it has a large degree of self-sufficiency. It is really a catalytic program.

It doesn't do a great deal of research which would be competitive with other more formally established research institutes, as the National Science Foundation or other well-established Government and quasi-governmental institutions.

Rather, it serves as a catalyst to bring people together within the United States and across frontiers, and to foster seed projects, projects which will be catalytic, which will lead to other projects around the world.

We particularly appreciate this program in the Department of State because we often point to it as the kind of program we feel UNESCO, in particular, and other similar international organizations should be doing.

It operates with a minimum of political friction. It fosters practical problem-solving approaches to issues which clearly overlap international boundaries, and it does so with a minimum of bureaucratic intervention at the international level or at the national level.

So we think that it is a good program and we see, for example, the many, very valuable results for the United States. For example, AID based a training course that it uses throughout the world on the results of a cooperative project in the Caribbean which brought together foresters from the various countries in the Caribbean.

We have joint biosphere reserve activities with Canada and Mexico. The MAB program played a key role in formulating and oil spill contingency plan and protocol, which the United States and 13 other countries in this region have just signed.

Since its inception in 1972, in that decade from 1972 to 1982, the United States has allocated about $3.5 million to this program. This includes a $1.2 million aid contract which was a 5-year contract, which was devoted to developing environmental profiles and training courses; and another $1.9 million has been spent on some 37 research projects around the country.

Now, the Office of Budget Management, as Congressman McGrath rightly said, has not included funds for the U.S. National Commission for UNESCO in this budget.

It happened that the MAB secretariat was housed with the U.S. National Commission for UNESCO. OMB, I don't think, was aiming at the MAB program when it deleted these funds from the 1984 budget.

It was really attempting to look at a 100-member body, which is the U.S. National Commission for UNESCO, and see if the work that that body was doing couldn't be better done in another way.

It was trying to shake up the U.S. National Commission for UNESCO to see if it could play a better role than it had been playing in the past and to see if it might be based more on private sector funding than on public sector funding.

So that is why the $480,000 was deleted from this budget. Now, part of that budget included about $50,000 for MAB, which went to pay for the overhead expenses because the MAB program was located in the same physical building as the U.S. National Commission for UNESCO, some salaries and some other expenses of a similar ilk.

There will be and there has been since the inception of the program some $60,000 contributed by State to the MAB programs themselves. This will continue. This is not part of the $480,000 that is being deleted.

My office, which is the Office for Communications in UNESCO Affairs in the State Department, will no longer provide the secretariat staff for the MAB program because with the National Commission's funds being cut, it was felt that this could be more appropriately transferred to another office in the State Department, and that office is the Bureau of Oceans, International Environment and Scientific Affairs.

Now, many of us for a long time have felt that there was greater expertise in that Bureau in the Department of State in any case to handle and to administer this program.

So that will continue if Congress, indeed, allocates the funds next year to the tune of about $60,000 for programs administered by the Office of Food and Natural Resources of the Bureau of Oceans and International Environment and Scientific Affairs.

That is a short-time solution to the MAB problem, many of us feel, and we are discussing the possibilities of finding a longer term solution to where MAB should be housed, how it should be administered and how it should be funded.

There are a number of options, as you can imagine, including some combination of public and private sector funding, and there are also options on where it might ultimately be located.

But the program will be maintained. It is afloat. It will stay in being until some of these options can be debated and considered.

I think that I will end my statement there, Mr. Chairman. Thank you very much.

[The prepared statement of Mr. Phillips follows:]

STATEMENT OF
JAMES D. PHILLIPS, DIRECTOR, OFFICE OF COMMUNICATION AND UNESCO AFFAIRS, BUREAU OF INTERNATIONAL ORGANIZATION AFFAIRS, DEPARTMENT OF STATE, BEFORE THE SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT, COMMITTEE ON SCIENCE AND TECHNOLOGY
TUESDAY, APRIL 5, 1983

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE, I WELCOME THIS OPPORTUNITY TO TESTIFY CONCERNING THE MAN AND THE BIOSPHERE PROGRAM, KNOWN AS MAB. THE PROGRAM WAS ESTABLISHED IN 1971 BY UNESCO (THE UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION) AS A SUCCESSOR TO THE INTERNATIONAL BIOLOGICAL PROGRAM (IBP). THE IBP HAD BEEN A SUCCESSFUL SCIENTIFIC RESEARCH EFFORT, BUT A NEED WAS FELT FOR AN INTERDISCIPLINARY, PROBLEM-SOLVING APPROACH TO ENVIRONMENTAL AND NATURAL RESOURCE ISSUES.

THE PROGRAM, AS ENVISIONED BY UNESCO, IS DIVIDED INTO FOURTEEN AREAS OF CONCERN. SEVEN AREAS INVOLVE PARTICULAR KINDS OF GEOGRAPHY (FORESTS, GRAZING LANDS, ARID LANDS, FRESH WATER RESOURCES AND COASTAL AREAS, MOUNTAINS, ARCTIC ECOSYSTEMS, AND ISLANDS); SIX INVOLVE SYSTEMS AND PROCESSES (MAJOR ENGINEERING WORKS, DEMOGRAPHIC CHANGES, URBAN ECOSYSTEMS, ENVIRONMENTAL PERCEPTION, PESTICIDE USE, AND POLLUTION); AND ONE INVOLVES BIOSPHERE RESERVES, AREAS PROTECTED FOR RESEARCH, MONITORING, AND CONSERVATION. NATIONS

PARTICIPATING IN MAB PLAN AND FUND THEIR OWN RESEARCH AND OTHER ACTIVITIES WITHIN THIS FRAMEWORK. BY LATE 1982, THE MAB PROGRAM INCLUDED OVER 1,000 FIELD RESEARCH PROJECTS ASSOCIATING OVER 10,000 RESEARCHERS IN 79 COUNTRIES AND COVERING ALL 14 AREAS OF CONCERN. IN THE U.S. OVER 800 SCIENTISTS ARE CURRENTLY ENGAGED IN SUCH PROJECTS.

INTERNATIONALLY, THE PROGRAM IS CENTERED AT UNESCO HEADQUARTERS IN PARIS WITH A STAFF OF TWELVE PROFESSIONALS, INCLUDING TWO AMERICANS. FROM 1973 TO 1982, THE U.S. NATIONAL PARK SERVICE AND THE U.S. FOREST SERVICE FROM TIME TO TIME DETAILED OFFICERS TO THE INTERNATIONAL SECRETARIAT. THE MAB INTERNATIONAL COORDINATING COUNCIL (ICC) MEETS EVERY TWO YEARS IN PARIS TO COORDINATE INTERNATIONAL ACTIVITIES AND PROVIDE DIRECTION TO THE MAB PARIS STAFF. THE CHAIRMAN IS MR. BALLA KEITA OF THE IVORY COAST. THE U.S. HOLDS ONE OF THE FOUR VICE CHAIRMANSHIPS ON THE ICC (THE OTHERS ARE CHINA, BRAZIL, AND THE USSR). DR. PAUL T. BAKER, CHAIRMAN OF THE MAB NATIONAL COMMITTEE, IS THE U.S. REPRESENTATIVE.

THE UNITED STATES MAB PROGRAM WAS ESTABLISHED IN 1972 BY THE DEPARTMENT OF STATE AS PART OF THE U.S. NATIONAL COMMISSION FOR UNESCO. IT CONSISTS OF THREE INTERLOCKING COMPONENTS. THE FIRST AND MOST IMPORTANT IS A LOOSELY STRUCTURED GROUP OF 135 SCIENTISTS, UNIVERSITY SCHOLARS, ADMINISTRATORS AND PRIVATE SECTOR REPRESENTATIVES WHO DONATE

PART OF THEIR TIME TO MAB ACTIVITIES. THEY ARE ORGANIZED IN 12 DIRECTORATES WHICH CORRESPOND TO MAJOR MAB ACTIVITIES, REPRESENT ALL RELEVANT DISCIPLINES, AND COME FROM ALL REGIONS OF THE COUNTRY. THESE SCIENTIFIC TEAMS CONDUCT JOINT RESEARCH, PLAN AND SUPPORT SCIENTIFIC CONFERENCES AND WORKSHOPS, AND PARTICIPATE IN INTERNATIONAL EXCHANGES AND COOPERATIVE EFFORTS.

A SECOND COMPONENT IS A SECRETARIAT COMPOSED OF THREE GOVERNMENT EMPLOYEES FROM THE DEPARTMENT OF STATE AND THE FOREST SERVICE WHO GIVE PART-TIME SERVICE TO ADMINISTERING AND COORDINATING THE PROGRAM. THE STAFF IS CO-LOCATED WITH THE SECRETARIAT OF THE U.S. NATIONAL COMMISSION FOR UNESCO.

THE THIRD COMPONENT IS THE U.S. NATIONAL COMMITTEE FOR MAB, A COMMITTEE OF THE NATIONAL COMMISSION, WHICH GIVES OVERALL POLICY GUIDANCE.

THE U.S. MAB PROGRAM SERVES THREE BASIC PURPOSES. FIRST, IT WORKS TO SYNTHESIZE AND INTERPRET BASIC SCIENTIFIC RESEARCH TO HELP PEOPLE SOLVE ECOLOGICALLY-RELATED PROBLEMS. FOR INSTANCE, THE URBAN ECOSYSTEMS DIRECTORATE (MAB-11) UNDERTOOK A MAJOR EFFORT TO INTEGRATE THE ISSUES, CONCEPTS AND METHODS OF WORK OF SPECIALISTS IN NATURAL ECOSYSTEMS AND THOSE WORKING ON HUMAN SETTLEMENT PATTERNS AND URBAN SYSTEMS. THE RESULT WAS A CONFERENCE ON "ECOLOGICAL APPROACHES TO URBAN DEVELOPMENT ISSUES" HELD A YEAR AGO, THE PROCEEDINGS OF WHICH WILL SERVE AS A GUIDE TO BOTH ECOLOGISTS AND URBAN PLANNERS.

SECOND, IT ACTS AS A CATALYST FOR COOPERATION BETWEEN NATURAL AND SOCIAL SCIENTISTS. EACH DIRECTORATE HAS REPRESENTATIVES FROM BOTH FIELDS WHO HAVE AGREED TO UNDERTAKE RESEARCH AND OTHER ACTIVITIES USING THE INTERDISCIPLINARY APPROACH.

AND THIRD, IT FACILITATES INFORMATION EXCHANGE BETWEEN THESE SCIENTISTS AND DECISION-MAKERS, BOTH IN GOVERNMENT AND IN THE PRIVATE SECTOR. AN EXAMPLE IS A MANUAL PREPARED BY THE MAB-5 DIRECTORATE ON HOW TO ASSESS THE EFFECTS OF POLLUTION UPON SPECIES DIVERSITY AND WATER ECOSYSTEMS FOR USE BY LOCAL AND STATE OFFICIALS RESPONSIBLE FOR IMPLEMENTING WATER POLICY OR STOPPING THE MISUSE OF WATER RESOURCES. MAB DOES NOT ATTEMPT, HOWEVER, TO DUPLICATE MAJOR SCIENTIFIC EFFORTS, SUCH AS THOSE FUNDED BY THE NATIONAL SCIENCE FOUNDATION. RATHER, IT SEEKS TO IMPROVE NATURAL RESOURCE MANAGEMENT THROUGH APPLIED RESEARCH, DEMONSTRATION PROJECTS, AND INFORMATION SHARING. IT IS UNIQUE AMONG INTERNATIONAL ENVIRONMENTAL EFFORTS IN USING AN INTEGRATED APPROACH TO SOLVING PROBLEMS INVOLVING HUMAN POPULATIONS AND THE ENVIRONMENT.

THE MAB PROGRAM IS VALUED IN THE U.S. BOTH WITHIN AND OUTSIDE THE GOVERNMENT. COSTS OF ACTIVITIES ARE GENERALLY LOW IN RELATION TO THE LEVEL OF PUBLIC AND PRIVATE U.S. SCIENTIFIC EXPERTISE IT HAS BEEN ABLE TO MOBILIZE AND MAINTAIN. PRIVATE U.S. SCIENTISTS PERCEIVE A PRESTIGE VALUE

IN PARTICIPATION AND HAVE PROVIDED SERVICES AT NOMINAL COST TO THE PROGRAM. THE FOREST AND PARK SERVICES, ALSO REPRESENTED HERE TODAY, VALUE THE INTERNATIONAL CAST OF THE PROGRAM, WHICH AFFORDS THEM OPPORTUNITIES TO PARTICIPATE IN MULTIDISCIPLINARY, RESOURCE-MANAGEMENT ACTIVITIES WHICH ARE NOT POSSIBLE TO CARRY OUT SOLELY WITHIN THEIR RESPECTIVE AGENCY MANDATES.

THE DEPARTMENT OF STATE SEES THE PROGRAM AS A WAY TO FURTHER INTERNATIONAL COOPERATION IN SCIENCE, ENVIRONMENTAL AND DEVELOPMENT ACTIVITIES. THE U.S. HAS FREQUENTLY POINTED TO MAB AS AN EXAMPLE OF THE TYPE OF USEFUL PROGRAM UPON WHICH UNESCO IN PARTICULAR SHOULD FOCUS--ONE THAT IS IN KEEPING WITH ITS MANDATE, ONE THAT BENEFITS DEVELOPED AND DEVELOPING NATIONS ALIKE, ONE THAT IS FREE OF POLITICS AND IDEOLOGICAL CONFRONTATION, AND ONE THAT HAS A PRACTICAL, PROBLEM-SOLVING APPROACH RATHER THAN A THEORETICAL ORIENTATION.

THE U.S. MAB PROGRAM HAS MADE SIGNIFICANT CONTRIBUTIONS TO BOTH OUR DOMESTIC AND INTERNATIONAL ENVIRONMENTAL AND DEVELOPMENTAL OBJECTIVES. EXAMPLES INCLUDE A MAB-1 TROPICAL FORESTS WORKSHOP FOR CARIBBEAN FORESTERS WHICH LED TO A MAJOR AID-FUNDED TRAINING COURSE IN SUPPORT OF THE ADMINISTRATION'S CARIBBEAN BASIN INITIATIVE; U.S. AND MEXICAN, AND U.S. AND CANADIAN, COLLABORATION ON STUDIES OF BIOSPHERE RESERVES ON BOTH SIDES OF OUR BORDERS; A MAJOR CONFERENCE ON THE IMPACTS OF LIMITED WATER RESOURCES FOR

AGRICULTURE IN THE ARID SOUTHWESTERN UNITED STATES, ATTENDED BY OVER 200 SCIENTISTS AND REGIONAL, STATE AND LOCAL DECISION-MAKERS; AND A MAJOR MAB CONFERENCE ON ENVIRONMENTAL MANAGEMENT AND ECONOMIC DEVELOPMENT OF CARIBBEAN ISLANDS WHICH HELPED MOBILIZE AWARENESS AND SUPPORT FOR A PROTOCOL ON "COOPERATION IN COMBATTING OIL SPILLS IN THE WIDER CARIBBEAN REGION", SIGNED LAST MONTH IN CARTEGENA, COLOMBIA, BY THE UNITED STATES AND 13 OTHER COUNTRIES OF THE REGION. YOU WILL HEAR OF THESE AND OTHER ACTIVITIES IN MORE DETAIL FROM OUR OTHER SPEAKERS. THE FEDERAL GOVERNMENT, IN RETURN, ENHANCES ITS OWN DATA BASE AT MINIMUM COST; FOSTERS VOLUNTARY PRIVATE SECTOR PARTICIPATION FOR BROAD PUBLIC PURPOSES; AND CAN TAKE CREDIT FOR COORDINATING AND FACILITATING SOLUTIONS TO REAL PROBLEMS, AT HOME AND ABROAD,RELATING TO THE ENVIRONMENT.

FINANCIAL SUPPORT FOR MAB HAS COME FROM A NUMBER OF FEDERAL AGENCIES, THE PRINCIPAL CONTRIBUTORS BEING THE DEPARTMENT OF STATE, THE AGENCY FOR INTERNATIONAL DEVELOPMENT, THE U.S. FOREST SERVICE OF THE DEPARTMENT OF AGRICULTURE, AND THE NATIONAL PARK SERVICE OF THE DEPARTMENT OF THE INTERIOR. THESE AGENCIES HAVE INVESTED OVER $3.5 MILLION IN PROGRAMS SINCE U.S. MAB'S INCEPTION. FOR EXAMPLE, FROM 1977 TO 1982 AID FUNDED A FIVE-YEAR, $1.2 MILLION CONTRACT WITH MAB TO PRODUCE A SERIES OF ENVIRONMENTAL PROFILES OF

DEVELOPING COUNTRIES, AND TO DEVELOP TRAINING COURSES AND SUPPORT MATERIALS FOR AID IN ENVIRONMENT AND NATURAL RESOURCES MANAGEMENT. IN ADDITION, THE MAB RESEARCH CONSORTIUM, FUNDED BY THE PARK AND FOREST SERVICES, HAS ALLOCATED $1.9 MILLION TO 37 PROJECTS SINCE ITS INCEPTION IN 1979. OVER 75 PERCENT OF THESE INVOLVE COOPERATIVE WORK WITH OTHER COUNTRIES RANGING FROM ZAIRE TO INDONESIA TO COSTA RICA.

THE DEPARTMENT OF STATE CONTINUES TO VALUE THE MAB PROGRAM, AND DISCUSSIONS ARE UNDERWAY WITHIN THE DEPARTMENT REGARDING THE FUTURE LOCATION OF THE ADMINISTRATIVE SUPPORT FUNCTION. SOME NEW ARRANGEMENTS WILL BE NECESSARY IN VIEW OF THE PRESIDENT'S FY 1984 BUDGET WHICH DOES NOT INCLUDE FUNDS FOR THE SECRETARIAT OF THE NATIONAL COMMISSION FOR UNESCO, OF WHICH THE MAB SECRETARIAT IS A PART. THE DEPARTMENT OF STATE WILL ASSIST THE MAB PROGRAM DURING A TRANSITION STAGE BY ABSORBING ITS STAFF AND PROVIDING SUPPORT FOR PROGRAM ACTIVITIES. NEVERTHELESS, WE WILL BE LOOKING TO THE NATIONAL COMMISSION, THE MAB NATIONAL COMMITTEE, AND THE PARTICIPATING SCIENTISTS IN THE DIRECTORATES FOR ASSISTANCE OVER THE NEXT YEAR. WE NEED THEIR ASSISTANCE IN EVALUATING A RANGE OF PROGRAM, MANAGEMENT AND FUNDING OPTIONS TO ENSURE THAT U.S. MAB CONTINUES AS AN ACTIVE AND USEFUL MECHANISM FOR PURSUING U.S. INTERESTS IN THE FIELDS OF ENVIRONMENTAL PROTECTION AND NATURAL RESOURCE MANAGEMENT, AND ALSO FOR PROMOTING INTERNATIONAL SCIENTIFIC COLLABORATION ON PROBLEMS OF FUNDAMENTAL IMPORTANCE TO MANKIND'S SOCIAL AND ECONOMIC DEVELOPMENT.

THANK YOU, MR. CHAIRMAN.

James Daniel Phillips

James D. Phillips was born in 1933 in Peoria, Illinois, but moved with his family to Wichita, Kansas, where he attended primary school. He graduated from the Holy Cross Abbey School in Canyon City, Colorado, and has a BA and MA degree from the University of Kansas at Wichita. Mr. Phillips completed a year of study at the University of Vienna in Vienna, Austria, and three years of graduate school at Cornell University. He completed all the requirements for a Ph.D degree at Cornell except the dissertation. He is a member of Phi Beta Kappa and the Honorary Political Science fraternity.

Mr. Phillips served in the U. S. Army from 1953 to 1955.

In 1961 Mr. Phillips entered the Foreign Service and has served in France, Zaire, Luxembourg and The Gambia as well as in the Department of State in Washington. Mr. Phillips has also served as a Foreign Service Inspector and participated in the inspection of Embassy Saigon and the CORDS Program in 1970.

In 1980 he served as a political advisor and member of the U.S. Delegation to the UN Conference on Women in Copenhagen, Denmark. From 1980-81 Mr. Phillips was a student at the National War College in Washington, D.C. He took up his duties as Office Director for Communications and UNESCO Affairs in the Bureau of International Organization Affairs in July 1981.

Mr. Phillips speaks French and German.

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BUDGET INFORMATION SHEET

MAB PROGRAM FISCAL YEARS 1977 - 1982

Fiscal Year 1977.....$125,000

State/OES - $60,000
ERDA - $30,000

Nat Comm - $35,000

Fiscal Year 1978.....$ 148,200

State/OES - $ 60,000
DOE - $ 40,000
AID - $ 15,200

Nat Comm - $ 33,000

Fiscal Year 1979.....$ 501,400

State/OES - $ 60,000
AID - $ 64,400
DOE - $ 40,000

Nat Comm - $ 35,000
Consortium - $302,000

Fiscal Year 1980.....$1,051,974

State/OES - $ 60,000
DOE - $ 50,000
Park Service $ 20,000
Interior $ 25,000
Forest Service $ 60,000
AID - $ 48,974

Nat Comm - $ 30,000
Consortium - $758,000

Fiscal Year 1981.....$ 767,824

State/OES - $ 60,000
Forest Service $ 60,000
DOE - $ 60,000
Interior - $ 30,000
AID - $ 67,824
Peace Corps $ 8,000

Nat Comm - $ 30,000
Consortium - $452,000

Fiscal Year 1982.....$ 502,066

State/OES - $ 60,000
Forest Service $ 30,000
Commerce - $ 1,000
Interior - $ 50,000
AID - $ 86,695 ($11,000 was given to working capital fund)

Nat Comm - $ 34,371
Consortium - $,240,000

Mr. MACKAY. Would it be fair to summarize your statement by saying this is a good program; the deletion of funding does not necessarily reflect the administration's disapproval of the program, just that it is almost like the song title, "Don't shoot me, I am the piano player." They were just standing too close to UNESCO; is that what you are saying?

Mr. PHILLIPS. I think that that is a very fair summary. As it was housed with the U.S. National Commission for UNESCO, and as its funding had been folded into that for a number of years, when OMB took a look at that institution, MAB got caught in the net.

But I believe it will be funded and will find perhaps a better, more effective home in OES in the State Department.

Mr. MACKAY. Has there been any consideration, Mr. Phillips, of perhaps locating it in another area entirely? Perhaps the National Academy of Sciences?

Mr. PHILLIPS. Mr. Chairman, I think that that is an option that has been considered and is under discussion by—and perhaps some of my colleagues here could speak to that better than I can. It is a solution which would have a great deal of logic to it.

But I don't think that any definite decision has been made on that question, as of yet.

Mr. MACKAY. Mr. Phillips, as I understand it, NASA is beginning an international program on global habitability, which will focus on environmental issues. Will MAB participate in this project or has that been discussed at this point?

Mr. PHILLIPS. Mr. Chairman, to my knowledge, that has not been discussed. Now, it may well be an area for discussion. I am just not aware of any discussions that have taken place so far.

Mr. MACKAY. I see. Mr. McGrath, do you have any questions?

Mr. MCGRATH. I just have one. The funding, as I stated, and as you have pointed out, is about $60,000. That is what we are talking about, the OMB cut.

Have there been additional cuts to this number in the past years?

Mr. PHILLIPS. The funding for this program has varied considerably over the years. We have some data on that.

We have spent, I think, to pick some representative—$125,000 was spent on MAB in 1977. By 1980, it had got to a $1 million, almost $1,100,000. In 1981, $767,000. Last year, some $502,000.

This year we are presently spending about $110,000. Now, some of those figures reflect the fact that this one-time grant from AID of about $1½ million was used up over a 5-year period.

But the resources we have invested in MAB has gone up and down over the years, and in times of budgetary stringency across-the-board, it tends to go down.

Mr. MCGRATH. Is that the only rationalization for reduction, that budgetary stringency, or are there other considerations that either OMB or State may have? We are starting to talk about some money when you are talking about $1.5 million as opposed to $60,000.

Mr. PHILLIPS. Well, now, the $60,000 is the State Department contribution.

Mr. MCGRATH. I understand.

Mr. PHILLIPS. That has been steady over the years. Other agencies, for example, the Forest Service in 1982 provided $30,000; the Department of Interior, $50,000; AID, some $86,000; a consortium of private sector donors provided some other funds.

But whether these funds have been forthcoming or not has depended to some extent on the particular needs or interests of the agencies involved. It is not just the State Department or an AID funded operation.

It includes Forestry, Department of Agriculture; Department of Energy in 1978 gave $40,000. They have usually targeted those on particular things they wanted to study, the particular projects they wanted implemented or looked at.

So it is hard to predict how those other agencies will budget in the future, but I think there are representatives from some of the agencies and some of the services here today who could respond to that question.

Mr. MCGRATH. Thank you, Mr. Phillips.

Mr. MACKAY. Mr. Phillips, where in the organizational structure, which as you have stated is a minimal bureaucracy, where does the function of evaluating MAB's performance and its capabilities lie?

Is that your responsibility in the Department of State?

Mr. PHILLIPS. Mr. Chairman, it is insofar as it is done within the Government, but as I am not an environmental scientist, nor a scientist of any kind, and none of my colleagues are, we have relied heavily on the U.S. National Committee for MAB and on participants to give us feedback and tell us how the programs are going.

One of the things I might say is that we found that the programs are very popular and considered to be cost effective and worthwhile by those who are knowledgeable, the scientists involved, and those institutions which pay their salary and permit them to contribute.

So our evaluations have relied heavily on nongovernmental inputs.

Mr. MACKAY. In preparing for this, Mr. McGrath, I discovered that this is probably the first time Congress has inquired into this program since 1971, and I would like to ask some fairly basic questions so we would have some record of this.

Clearly this program is contemplated as being part of an international effort and your written testimony gives some of the scope of that effort, which is fairly broad.

Is there some point at which we are carrying our share of the load and where is that point?

Are we now at it, below it, or above it?

I will also ask some of the other participants to give their opinions on that question.

Mr. PHILLIPS. I think that it is an excellent question and I do believe that some of the other participants will be able to respond much more precisely than I can.

However, I can say that it is a UNESCO program, but it gives the responsibility to the member states of UNESCO to design and carry out their own particular projects.

It fosters international cooperation, but doesn't administer international cooperation. Now, the United States, I think, is clearly the lead country in participating in MAB projects.

We have a great deal of expertise in this area and we are looked to by the rest of the world as the leader in many of these areas that we are studying. However, other countries and other nations, large and small, do make their contribution.

I think that it would be safe to say that the U.S. contribution has been in the forefront and that the international community relies on us continuing to participate in this program to the extent that we can.

I am not able to compare in financial terms what we are doing, let's say, as opposed to the Federal Republic of Germany.

I don't have those figures with me, but we would be glad to supply a comparative data base like that to the committee at a later date.

Mr. MACKAY. If that is available without too massive an effort, I think that that would be a very good part of the record.

Mr. PHILLIPS. I believe that we can do that, sir.

Mr. MACKAY. Thank you very much, Mr. Phillips. We will go forward, then, if there are no further questions or if you have no further comments.

[The information follows:]

Evaluation of the U.S. Man and Biosphere Program Provided to Congressional Subcommittee on Natural Resources, Agriculture, Research and Environment (as requested by Congressman Kenneth "Buddy" MacKay).

PAUL T. BAKER, CHAIRMAN, U.S. MAB PROGRAM, SEPTEMBER 23, 1983

The following is my personal understanding of the findings and recommendations derived from evaluation efforts undertaken by the National Research Council's Subcommittee on UNESCO Science Programs, the staff of the U.S. Man and Biosphere Program and the newly constituted Executive Committee of the U.S. Man and Biosphere Program.

FINDINGS

1. The U.S. MAB Program has in recent years made highly significant contributions to the solution of environmental management problems. These contributions are particularly apparent in the Biosphere Reserve Program, the research and policy activities of the Tropical Forest Directorate and the environmental policy conferences of the Caribbean Island Directorate. Directorates concerned with the problems of Temperate Forests, Grazing Lands, Arid and Semi-arid Lands, Freshwater and Environmental Pollution have also actively promoted scientific inter-disciplinary consideration of problems and made substantial contributions to both the research and policy literature in their respective topic areas.

2. The U.S. MAB Program has been unusually effective in translating current scientific knowledge into a format useful for practical decision making on environmental problems.

3. With the possible exception of the Biosphere Reserve Program, all of these directorate activities have been substantially reduced in scope during the last two years as a result of a rapidly declining Federal funding base for the U.S. MAB Program. This decline has occurred in spite of an increase in private sector support.

4. Those directorates in the program which are particularly concerned with the human aspects of the Man and Biosphere interaction have been least productive due to the almost complete lack of Federal funding.

RECOMMENDATIONS

1. Since the environmental problems considered by the U.S. MAB Program are in general becoming more rather than less serious, the Program should not only be retained but, whenever possible, expanded.

2. Since single scientific discipline approaches have often failed to solve man-environment interaction problems, more effort should be devoted to developing multidisciplinary policy and research.

3. The U.S. MAB effort should be reorganized to achieve the following goals:

a. strengthen successful national MAB programs;
b. utilize more fully the international cooperative mandate of MAB; and
c. generate support for more integrated research projects with policy implications.

CONCLUSIONS

1. While the U.S. MAB Program has made important contributions to the solution of environmental problems both within the U.S. and in regions important to the U.S., it has been severely hampered by the agency mission specific funds made available to it. This problem cannot be solved unless Congress makes available funds which will directly support U.S. MAB objectives.

2. The basic research component of the U.S. MAB national and international programs has not been commensurate with the capabilities of U.S. research scientists. More importantly, the programs have not been large enough to cope with the dimensions of internal and external environmental problems which affect the well being of the U.S.

3. In order to implement the commendations, the Chairman of U.S. MAB should make every to heighten public awareness of the successes and problems of the MAB Program; inform Congress of the need for Federal funds to meet U.S. MAB objectives; modify the U.S. MAB Program to meet committee recommendations; and locate the ongoing U.S. MAB Program in the Federal agency or government related group most appropriate to the program objectives. Prominent among those organizations mentioned by the evaluating groups were the U.S. National Academy of Sciences, the Smithsonian Institution and the National Science Foundation.

Mr. MACKAY. We will go forward with Dr. Baker. Dr. Baker, if you will come forward and give us a short summary of your testimony, we would then see to it that your entire written statement is made a part of the record.

STATEMENT OF PAUL T. BAKER, U.S. MAB PROGRAM, PENNSYLVANIA STATE UNIVERSITY

Mr. BAKER. Thank you, Mr. Chairman. I am actually very pleased that this meeting is happening at this point. The question that you have just raised in relation to evaluating and appraising the program has been my principal concern in the very short time I have been chairman.

I was associated with the international biological program and with the inception of both the U.S. and international MAB, and have continued to be very active in the international program, but I actually have been rather inactive in this program for the last 3 years. So when I was asked to be chairman in January, I felt that one of the first things required was an appraisal, an evaluation of the program, what its strengths and weaknesses have been.

Fortunately, I had sort of a detached base from which this was possible for awhile, and that was that I was serving as chairman of the National Academy's Committee on UNESCO and Science Affairs.

So we assembled two meetings very quickly with some outsiders with well-known qualifications, as well as some of the principal chairmen of the program, and took a look. I don't think that we are anywhere near finished with that look at the strengths and weaknesses, but I thought that it might be most useful if I were to comment on as I see it at this point what the strengths and weaknesses are.

Certainly, the international program, I must reinforce what Mr. Phillips has said. It has been clearly one of the most successful programs that UNESCO has had in years and one with very few political complications of any sorts, well viewed.

The program has been a remarkably useful one not only, as many of the recent programs have been, to the developing countries, but also to developed countries. The secretariat in Paris has been very sympathic toward U.S. problems and very helpful in U.S. sciences.

Coming back to our own program, I must start out with the fact that, of course, you will hear some of the strong points and the strong accomplishments of the program in the subsequent testimony.

Certainly, I feel that such accomplishments as the biosphere reserve, the enormous effect we have already had on policy and environment problems in the Caribbean and some of the others are really quite impressive accomplishments.

There have been some problems, and the problems, I think, have grown rapidly in the last few years. One of the problems has been a kind of inflexibility in the program, a structure set up some 6 to 8 years ago that has not been looked at carefully, thought about modifying; a tendency to not pick up dynamic new programs which should be integrated in it; a failure to eliminate some that weren't too productive.

That would simply come from a failure to overview the program and look at it more seriously. The others have really been budgetary problems, and I would come back to the questions that were raised on the budget and go back to Mr. Phillips' figures.

If we go back to 1980, the program was at that time over a million dollars, and that million dollars is actually all in direct funds. We have tried since then to look at the question of what we might call the contributed funds from the private sector.

What is the size of this program that this million dollars of primarily Government money went in to support? We simply can't assess exactly what it is.

Certainly at the peak of that program there was anywhere from $5 to $10 million of research being undertaken or advising the decisionmakers and so forth, but the exact figures are difficult to find.

Nevertheless, the amount of external and volunteered help has really been enormous. We asked recently some of the directorate chairmen in this what kind of contributed manpower had been put in from outside.

We come up with some astonishing figures. Some of the very small directorates have put in, say, $250,000 in contributed time in the last few years, and then the large programs, such as a biosphere reserve, we find that as much as $800,000 in volunteer labor occurred in that program in just 1 year. This included time by scientists, by outsiders working in the program and so forth.

So I hope that we would be able to get a better quantification on what the program involves in the next year. We really, until quite recently, were unsure that the program was going to continue, and I am very relieved that at least we have a basic one.

But I am not sure that it is enough yet to really talk about having an ongoing, viable program. As you heard, the program this past year was down from a $1 million program to a $110,000 program.

This is not a long-term viable proposition. I am the head of a rather small department in a university, and I operate on a mil-

lion-and-a-half-dollar budget for a small department. Here is a program that attempts to do something massive in relation to our environment problems and I worry about where we would find $50,000 just to provide some kind of travel or communication in the system.

So I am delighted that it is happening, but I feel that in the long run, if MAB is to remain a viable program and really contribute to the United States, the resources must be greatly expanded.

It is a strange occurrence. It seems that the program sort of lost—almost lost completely simply because it wasn't visible at the funding level.

I think that I have covered the major points that I want to. I am very delighted we have the year because it seems to me that my first job, the first job of this program, is really a self-evaluation. Among that evaluation is not only how to improve what is going on, but where to build, and more important, this question of long-term home.

We, in these external evaluations, did consider long-term home. We see some problems. I would point out that this is, after all, an intergovernmental program. Therefore, no matter how much we involve the private sector or how much it contributes, it would really be inappropriate to have the basic secretariat as a private sector secretariat.

At the same time, there are quite obvious problems in trying to house it in any department or agency in the Government, because almost all have special tasks or missions which do not include this sort of broad scope, interaction kind of research.

For that reason, certainly many members of the committee, the evaluation committees, suggested that we look for a long-term, permanent home in an area that can accommodate this broad scope without mission problems.

One of the possibilities certainly would be the National Academy's National Research Council. They, of course, feel that they must do what the Government requests of them in science, and so I am sure they would be willing to take it on, given the resources.

This isn't the only alternative. We are looking at some others. There are possibilities that a home such as the Smithsonian, again, that has broad scope, might be possible. But we don't know.

Certainly, my feeling, the major task and the first task is going to be this appraisal and reorganization and rebuilding in flexibility to the program.

I believe that those are the major points I wish to cover.

[The prepared statement of Mr. Baker follows:]

Statement of
Paul T. Baker
Chairman of the United States Man and Biosphere Program (MAB)
before the Subcommittee on Natural Resources,
Agriculture Research and Environment,
Committee on Science and Technology
House of Representatives
April 5, 1983

Mr. Chairman and members of the Subcommittee, as Chairman of the U.S. MAB Program, I am particularly pleased that at this time an evaluation of the U.S. effort is occurring. Such an evaluation is highly appropriate, since the UNESCO program itself has been recently subjected to a critical reappraisal at the end of its first decade. As newly appointed Chairman of the U.S. efforts, I also believe my first duties involved a careful appraisal of the past and present U.S. program. Only from such an appraisal can a plan for the future be developed.

I, therefore, believe that my testimony may best serve your needs first by openly sharing with you the results of these appraisals in terms of successes and failures of the program, then I will discuss the current problems and finally present my thoughts on the possible future direction of the program.

To aid you in weighing the reliability of my judgments it may help to begin by telling you something of my professional background and the evaluation effort I have initiated. I am presently an Evan Pugh Professor of Anthropology and Head of the Department of Anthropology at the Pennsylvania State University. I have been continuously involved in research on how the health, social structure and well being of human populations relate to the natural environment since my first professional position as a researcher for the Climate Research

Laboratory of the U.S. Army. I was closely affiliated with the International Biological Program (IBP) to which Mr. Phillips alluded in his testimony and served on the Executive Committee of the U.S. IBP in the early 1970's. As a consequence of these activities I was also active in the early formulation of both the UNESCO and the U.S. MAB programs. My appraisal of the program is based on two meetings I chaired for the National Academy of Sciences Subcommittee of UNESCO Science Programs. At the first meeting in 1982 a group of scientists assessed the value of UNESCO for U.S. science. It was apparent to the committee that within the UNESCO scientific effort the MAB program was one of the most useful for the needs of the United States. During the past month an especially convened committee undertook a review of the U.S. efforts in relation to MAB. This committee included not only participants from within the U.S. MAB program but also prominent scientists from outside the program. In this meeting the successes and failures of the program were critically reviewed and the present and future needs carefully assessed. Based then on this experience, I would like to offer the following observations on the international and national participation in the MAB program.

First, the rationale for the international program must be considered. As I perceive them the issues were the following:

1. Population growth, new types of biosphere use, and rising economic expectations were all leading to deteriorating natural environments in many developing countries. This deterioration often adversely affected not only the environments of the particular countries but also neighboring areas. Often the changes affected not only the health and well being of people in a given region but also affected people throughout the rest of the world.

The problems of these developing countries were sometimes solvable but the countries often lacked the scientific experience, personnel and resources to identify and solve the problems.

2. In developed countries, including the U.S., problems of environmental degradation also occurred. The expertise to solve many of these situations was generally available within the country but communication between appropriate scientists and decision makers was poor. As in the underdeveloped countries, research was also needed to prevent some of the environmental degradation but because of the specific missions of most government agencies and the extreme disciplinary specializations of most scientists, it was generally impossible to organize and fund the necessary integrated research.

To attack these problems the UNESCO MAB program was initiated in 1971. The relative world-wide success of the program is shown by the fact that at the last UNESCO General Conference the MAB program was viewed as the most useful of all UNESCO programs. Indeed, it was suggested by the Conference, with the support of the U.S., that the MAB program should be expanded.

Now I will reflect briefly on the history of the U.S. efforts in relation to MAB.

The U.S. program under the chairmanship of Donald King from the Department of State was initiated with large-scale plans to match the level of the international program. The U.S. Committee for MAB included representatives from all the appropriate government agencies and from all interested non-governmental groups such as the Wildlife Federation and the Sierra Club. In addition, directorates were appointed to cover 13 of the 14 topic areas

originally considered as integral to UNESCO MAB. The initial phase of the program was supported by the departments of State, Interior, and Agriculture. It was, of course, hoped that, as had occurred with the IBP, Congress would appropriate direct funds for U.S. MAB activities. This did not occur. Instead OMB directed in 1979 that selected departments and agencies support the U.S. MAB program.

This directive did not have the hoped for long-term effect. While initially fiscal participation was increased, a severe loss of support from all sources followed.

United States support for the international objectives of the UNESCO MAB secretariat took two forms. First, through U.S. MAB efforts the Forest Service and the Park Service made substantial contributions to the international development of biosphere reserves and, as you will hear in later testimony, these agencies can be justifiably proud of their contributions. Second, non-governmental scientists made significant contributions to the international program and in return the UNESCO MAB secretariat contributed in a number of ways including financial ones to U.S. scientific endeavors. It should be noted that much of the non-governmental interchange occurred outside of U.S. MAB efforts.

In the testimony which follows mine you will hear what I consider to be the greatest successes of U.S. MAB. Of these the Biosphere Reserve Program strikes me as the best example of how a national MAB program can reach beyond the ordinary mission-oriented government agency to achieve the new educational, research and conservation goals of MAB. As such, I suggest it will serve the long-term needs of U.S. citizens as well if not better than our traditional National Park system.

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You will also hear how such directorates as the tropical forest ones have served both U.S. and world needs by promoting education and research on the problems and management of the tropical forest.

We are also pleased to have Dr. Belier testify, since the evaluation of the U.S. program accomplishments indicated that his directorate was an outstanding example of the value of small investment in a U.S. MAB directorate. This directorate not only helped to solve U.S. environmental problems, but also worked with U.N. agencies and small developing countries in the Caribbean to examine and solve their problems.

The testimony you will hear certainly does not review all of the U.S. MAB contributions to U.S. needs. After our recent reviews I could cite many more. However, I would be remiss as an evaluator if I did not also point out some of the past failures and present problems. In my opinion, the failures have been twofold. First, the promotion and development of truly integrated research programs designed to detect and solve major problems of man and environment interaction have been deficient. With the exception of the Biosphere Reserve Program no U.S. program fulfills these objectives in the broad sense set forward in the international MAB program. We should be a leader in this effort. Instead, we lag behind many other developed countries. This can be attributed in part to the lack of directed government funds. It has also occurred because the U.S. MAB program has not been acute at identifying and promoting such efforts underway in the private sector. The second problem, related to the first, is the fact that the program has in recent years tended to rigidify and to support directorates which were no longer productive while it has failed to incorporate new and dynamic individuals

and groups who could help with contemporary issues. The blame for this does not rest with the U.S. MAB secretariat. Indeed, without the efforts of the current Executive Director (Brooke Holmes) it is doubtful that there would be a functional U.S. MAB program to present to you. Instead the problem rests with a rapid shrinking of the funding base for MAB activities and the lack of clear governmental support for the overall objectives of U.S. MAB.

The past failures of the U.S. MAB program can be rectified, and as its current Chairman I am dedicated to their solutions. However, neither the continuing function of U.S. MAB's highly successful programs nor its revitalization for the next decade can be assured unless its immediate fiscal problems can be resolved. The core of these problems is the continuation of its secretariat. The private sector is and has been very willing to help MAB both nationally and internationally. My University, along with many others, is contributing substantial faculty time and resources to the program. Private industry and private agencies are also contributing. However, none of these is currently prepared to support a secretariat. Indeed, why should they? MAB is an intergovernmental effort. The U.S. effort is as it should be--a collaborative effort of government and the private sector--but clearly the central secretariat is a governmental responsibility. Mr. Phillips has indicated to you that the Department of State feels some responsibility to support the program. Yet, this obviously involves a reduction over current funding. My own discussions with representatives from all the involved agencies has led me to believe that no agency of the Federal government is willing to commit the long-term fiscal support necessary for a broad based program such as MAB.

This view is understandable in light of the mission-specific responsibility placed on each agency or department of the U.S. government. Therefore, our recent review of U.S. MAB programs indicated that in the long term the most suitable home for a secretariat might be the National Research Council of the National Academy of Sciences. Such a move is at the moment not feasible because of the lack of funds.

Such a proposal should be seriously considered for future action. For the coming fiscal year secretariat funding, personnel, and space must be maintained at its present level in order to provide continuity for the successful U.S. MAB programs and funding to plan for new ones. A one-year continuation of the secretariat by the Department of State is essential if the program is to survive.

In summary, I believe that UNESCO MAB and U.S. MAB are programs of the utmost importance for the U.S. and are the most tangible return to this country from our current contribution to UNESCO. The U.S. program has contributed and is contributing significantly to the welfare and policy of this country. It is, however, in danger of foundering for lack of a very small fund for the maintenance of its secretariat and a home compatible with its broad and integrated program.

Thank you, Mr. Chairman.

PAUL T. BAKER

Personal Data:

Born February 28, 1927
Married, four children

Education:

B.A. - University of New Mexico, 1951
Ph.D. - Harvard University, 1956

Employment History:

Evan Pugh Professor of Anthropology, The Pennsylvania State University, 1981-present
Head, Department of Anthropology, The Pennsylvania State University, 1980-present
Professor of Anthropology, The Pennsylvania State University, 1964-present
Acting Head, Department of Sociology and Anthropology, The Pennsylvania State University, 1964-65
Research Physical Anthropologist, U.S. Army Quartermaster Research and Development Center, Environmental Protection and Research Division, 1952-57

Honors:

Member, National Academy of Sciences, 1980
Huxley Memorial Lecturer and Medallist of the Royal Anthropological Institute of Great Britain and Ireland, 1982

Research Activities:

Peru - directed 10-year research program on interaction of people with their natural environment at high altitude
Samoa - currently directing research on migration and modernization
Nepal, Tunisia - directed research on human populations and environmental interaction problems.

Professional Positions:

International Coordinator, High Altitude Program, Human Adaptability/International Biological Programme, 1965-74
President, American Association of Physical Anthropologists, 1969-71
Member, U.S. Executive Committee, International Biological Programme, 1970-74
Consultant to UNESCO MAB, varying periods from 1973-present
President, Human Biology Council, 1974-77
Chairman, U.S. MAB 12 Directorate, 1975-77
President, International Association of Human Biologists, 1980-85
Chairman, U.S. Subcommittee on UNESCO Science Programs, 1982-84
Member, U.S. Delegation to the International Congress of Anthropological and Ethnological Sciences, 1982-88

Publications:

Author or editor of 114 research articles and books, including The Biology of Human Adaptability (1966); Man in the Andes: A Multidisciplinary Study of High Altitude Quechua (1976); Human Population Problems in the Biosphere: Some Research Strategies and Designs (1977); The Biology of High Altitude Peoples (1978); State of Knowledge Report on Andean Ecosystems, Volume 2: Human Population and Biosphere Interactions in the Central Andes (1982).

Mr. MACKAY. I guess that is a fairly unusual circumstance, to come in and be in the middle of evaluating a program and discover that its budget just got zeroed out.

Mr. BAKER. Yes, it does change priorities a bit.

Mr. MACKAY. Then let me summarize, so that I can be sure I understand. You are saying, in essence, as I understood Mr. Phillips to say, that the fact that the budget was zeroed out at the Department of State does not in and of itself mean the program would terminate.

The program, in fact, is largely a public financing of a coordination mechanism, and it contemplates a great deal of volunteer or contributed effort, and also such private sector funding as you can locate.

The real question that would bother me is what are the other nations going to read into the totally zeroing-out of this budget from the country which apparently got the whole idea going in the first place.

Mr. BAKER. Well, I think that there are a couple of problems in that regard. First of all, we actually debated and discussed the possibility of simply letting MAB disappear. What would be the consequence of that if we did that in the United States?

Even within the United States there are some serious consequences. We have this massive program in the biosphere reserve. It is built in as part of an international program.

If we would cancel out—I believe one of the speakers later will be willing to comment in more depth on that, but essentially we could not sanction or create biosphere reserves or work on them without this program.

There are a number of others, but that is a very concrete example of a very serious consequence.

Mr. MACKAY. Let me excuse myself for interrupting you and ask you if you would give kind of a thumbnail sketch of the biosphere reserve program.

If I understand it correctly, it is a very important program.

Mr. BAKER. I think that it is quite an impressive program. It uses public lands and I am sure the speakers are going to be able to give you much better information than I can, but uses public lands to designate an area as a reserve where research can be attempted, that it preserves genetic material, but at the same time, is an experimental center that we can work with and see how we can produce interactions of a given population with that environment without excessive destruction to the environment.

There are 38 such reserves in the United States. Among the larger ones, there is one contiguous to the Everglades National Park in Florida, the current volcano area in Hawaii, and there are a large number of other ones.

There is also a network of them in countries throughout the world. Lots in Europe; some in Asia and Africa. There is an exchange of information.

The United States was very important in starting this program and keeping it going. The Park Service and Forestry provided personnel on loan to the Paris office to help this start. One of our

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major successes in the MAB program, both nationally and internationally.

If I could come back briefly to your other question of how would we appear in the world, I think we would appear more than a little—I don't know what kind of word to use—foolish—it would simply be quite un-understandable when all the developed countries are involved in this, and major programs, the underdeveloped countries utilize it. American scientists have been major contributors, not only on behalf of the United States, but the UNESCO Secretariat in the other countries have called upon them as advisers.

For us to withdraw from that—as a matter of fact, if we withdrew, I am not quite sure—this is one of the most major values we receive from UNESCO in science. That was one of the conclusions of the committee in the Academy, that in science it is perhaps the most useful exchange program with UNESCO, both in information coming to this country and information going back.

We would really be withdrawing from our major involvement and function in UNESCO.

Mr. MACKAY. You have testified as to the reduction in the level of support over the past 2 years. Are you yet at a point in your evaluation so that you can give an opinion as to the impact of this on the effectiveness on the program or would it be better if we waited and asked you to give us your conclusions at the end of that?

I would like to do both, really.

Mr. BAKER. At this point the reduction level has been so rapid, it is difficult to tell. There is a great deal of material still coming in from programs a year or two ago, so that you see a very active program there.

But there is the fact that, for example, our governing body had not been convened for several years, over 2½ years. This is a real problem. That there is a lack of communication going on within the program already.

We are seriously concerned that for various reasons we won't really have a very functional office at all this summer. We will not have a trained scientific director, an administrative assistant will be out sick. There is no secretary that has worked with it.

We are even talking about having to have part-time help to answer the telephone. So it is reaching a critical lack of mass. But presumably it will rebuild a little bit by fall, but it is really almost becoming nonfunctional.

Mr. MACKAY. Is the lack of convening a function a lack of funding or is it a function of lack of direction?

Mr. BAKER. I have to say both. Let me say that, in fact, the secretariat itself has been the only thing that has really kept this program alive last year.

They have had no real structure above them to help them and they have had to do it all on their own. But it has been a difficult problem.

Mr. MACKAY. I was just trying to make sure I understood what you were saying. You said the secretariat is probably the main mechanism which has kept it alive.

You mean the secretariat in France?

Mr. BAKER. No. I mean the secretariat in this country. Brooke Holmes is the scientific director of the administrative system. That is what it has lacked—any kind of scientific structure, it has lacked a chairman, and it has lacked an executive committee.

There has been the problem of such restricted funds that he has felt that he can't really call on this rather broad body of directorate chairmen just to come together and give them help because he is not empowered to be the chairman. It has really been a kind of rudderless ship and kept afloat only by their efforts.

Mr. MACKAY. I see. Well, that is quite an eloquent testimonial. Where I come from we put a lot of stock in testimonials, and that was a good one.

So you are saying that the level of funding now is such that it is not possible, really, to bring all of the heads of the 14 groups together to talk about the whole overview question, and overview is what it is all about?

Mr. BAKER. Well, that is quite correct. If we were to bring all our 14 chairmen here, we would, in essence, use nearly 25 percent of our whole budget, and that would not leave any money for them, each of which has a structure of 5 to 10 people, to ever talk to their people.

So even talking is getting to the levels of impossibility.

Mr. MACKAY. So the dilemma Mr. Holmes has faced is the day he calls a meeting will be the last day he has got money to pay his salary. That is unique even for the Federal Government.

Have you been able to form any conclusions yet about alternatives Mr. Phillips talked about, about the possible relocation of the secretariat within the Department of State or elsewhere?

Mr. BAKER. It is quite clear to me that given the leadtime that is required for any budget considerations and so forth, that really our first problem has been to find anybody that would provide us a home and space and money for the coming year.

I am delighted that it now appears that the OES group in the State Department are willing to do this for the coming year. I think that this is a reasonable solution.

I don't see any other solution. It certainly gives us the time to rethink, reappraise and try and build a program. As part of that, I think that we will look much more carefully at the question of a long-term home and so forth.

I believe that those arrangements are now complete, although it has been a down-to-the-deadline discussion.

Mr. MACKAY. Dr. Baker, thank you very much for your testimony and your candor. I would like to ask you when you have completed the evaluation, if there is any report or summary or conclusions, if you would file those with the subcommittee. That would be very helpful.

Mr. BAKER. I would be very pleased to provide you that.

Mr. MACKAY. Thank you.

We will next hear from a panel of Dr. Edward Fernald of Florida State University and Mr. William Beller. As before, I would suggest that you give us a summary of your testimony and then we will, of course, file the full statement as part of the report.

Dr. Fernald is involved with the effort in the area of fresh water resources and hazardous wastes, and Mr. Beller is involved with

the study of Caribbean island ecosystems. So if it is agreeable with you, we will start with Dr. Fernald and then Mr. Beller.

STATEMENTS OF EDWARD A. FERNALD, FLORIDA STATE UNIVERSITY, AND WILLIAM BELLER, CHAIRMAN, U.S MAB DIRECTORATE 7B

Mr. FERNALD. Thank you, Chairman MacKay. I am very pleased to be able to testify this afternoon. I have submitted my written statement.

I chair the directorate on fresh water resources and have been involved with the MAB program for about 8 years. We, as a fresh water directorate, cooperate with a number of other directors and we specifically are interested in impacts of human activity on water resources.

Approximately 90 percent of our activity deals within the United States, but we have had some international activity. We have several broad developmental goals that I would call your attention.

One, we develop water management strategy alternatives. We develop fresh water ecosystem protection techniques. We are interested in developing a conservation ethic toward water and we are also interested in developing management strategies for controlling pollution of water.

Our activities have been more in the area of applied research and problem solving, rather than in the specific area of basic research, although some has been done by us, certainly.

Some examples that I can give you, a couple of years ago we put out a handbook for water managers. Professor Cairnes from VIP took several sophisticated scientific studies and boiled those down to more simple terms and set them up in terms of a handbook, so that water managers might train their staffs in pollution assessment.

This handbook was a success, and it was to be one of several handbooks, but we did not have the money to support even the compilation and analysis of data and the publication of the next handbook. So that is the only one we have got.

Our second one was to be a manual on the art of river restoration in not only our country, but the world. This is an important activity and it still needs to be done.

In the area of fresh water ecosystem studies, we have studied several river systems. You would be familiar with the Apalachicola, the Econfina, and the Fenholloway.

Those have been studied over the long term and man and the biosphere has participated to a small degree in the support of those studies, and presently we are working with the Apalachicola data and will shortly come out with an Apalachicola atlas, which will be a great benefit to not only the States of Florida, Alabama, and Georgia, but other scientists who are interested in long-term river and estuary systems.

Part of our work was presented to the Federal Government and a national estuarine sanctuary was set up in that, so we have seen some very positive results of our work.

Another study was a watershed management study of the Everglades. That will also be a book that will be out within the next 6 months.

A scientist in California has been doing some long-range baseline studies to evaluate human impacts on Lake Tahoe in California and Nevada, a very important study that will have a lot of practical applications.

Two projects that I would like to call to your attention that were not done that I think are important. One was a request from the Department of Natural Resources in California to help them in a study of Mono Lake, which is a very unique ecosystem on the east side of the Sierra Madre Mountains, and it is a lake from which water—water is taken from a tributary, I should say, to help provide water for the city of Los Angeles and a number of the agricultural areas between that river and Los Angeles.

As a consequence, Mono Lake has lost 40 feet in elevation in the last 40 years. It is a tremendous problem. We were asked to work on that, and we would have loved to have done so, but we were not able to get the money after showing initial interest.

Internationally, we were asked by a MAB chairman in Canada to participate in a cooperative study of the scientific studies of the Great Lakes.

We showed initial interest in that and then were unable to get the funds to do that, so we were somewhat embarrassed because of that, but we did not get to participate there.

On the international level, our directorate has supported a medical doctor and several interns who did a study of water-related disease in Guatamala at the beginning of the rainy season.

This did help folks in Guatamala, but it also helps us because there is transfer value, and that is field research and good training for individuals that participated, and that, too, has been turned out as a publication of MAB.

We have a proposal in now, a request from the Philippines, to help them study the excessive stream erosion and sedimentation induced by rapid deforestation in that country, and we don't know whether we will be able to work on that or not.

Most of that study will be underwritten by other sources, but we still need some man and the biosphere support. An important point of our studies is that almost everything we do has transfer value.

If we do a study in the State of Florida or in California, we generally work up the methodology so that it can be transferred to another area. We are pretty careful to include that in our studies.

We have worked on a water resource decisionmaking model. This considers the special problems in water management and this was applied to an evaluation of water policy in Florida. That study has been used by the Florida Legislature.

Out of that they realized that we needed more and better data for decisionmaking. They have funded a water atlas for Florida, which we are now undertaking and that will be completed in a year.

That, too, will be written up as a methodology so that other States won't have to go through some of the initial problems we had in developing such an atlas. A developing country might utilize that also.

We are working on impact of hazardous waste sites on water quality and we are working primarily now on the nonstructural aspects of this, not only on the cleanup and how do you make an assessment of hazardous waste and water quality, but also in developing management strategies to prohibit the formation of these sites.

This kind of thing is very fiscally responsible because when EPA considers that in their experience, Superfund has spent $5 million per cleanup, if we spent $500,000 and kept even one site over the United States from developing, we would have much more than paid the bill.

On the other hand, we might just keep dozens of sites, to use a conservative figure or amount. We are planning a hazardous waste management symposium for developing countries.

This is in the planning stage. Whether or not it will go strictly through MAB or we will cooperate with UNEP, United Nations environmental program, we are not sure.

But we are talking about that. Kurt Waldheim has been a professor at Florida State and has given us a letter of support because that kind of activity is very important and he indicates in that letter that he was familiar with and very pleased with the MAB program.

In summary, I would like to—I guess I will get a little from personal experience, now. This is a multidisciplinary program.

It is a problem solving approach that I think is very valuable. It is something that does not duplicate. It overlaps some places, but it doesn't duplicate what is being done in other agencies.

One of the reasons is that we are not limited to agency boundaries. That is not a critical comment at all, but we do have more latitude.

Theoretically, every scientist in the country is a potential MAB member. We can reach out beyond our directorates. When someone needs a specialist in an area, we generally know who that person is and they come in very willingly and in almost every case will donate their time to participate.

This is a kind of a talent pool that I think we should take advantage of.

The program is efficient. As I indicated, most of our scientists on our directorate and the others have donated a great deal of time.

This is, of course, supported by the local universities. I know Florida State has donated a good bit of support help to the man and the biosphere program.

The program has an education and training element. I think that that is important for young scientists who are coming up in our country.

It has an international relations benefit. I have taken part in different international conferences for man and the biosphere.

I have benefitted. I believe the people from other nations have. They take a great deal of interest in what we have to say and what we do.

I feel we get way more than the money we put into it just in international relations aspect, as well as the fact that this is an international science benefit, and the United States benefits from knowing what they are doing, the other countries are doing.

To me, it is just in the best interest. It is the best kind of cooperation at the international level, and I think it should be encouraged.

It is objective science, and many times, as you are familiar with the problems of the Apalachicola with Georgia, Alabama and Florida. Sometimes we need someone from Nebraska to come in and tell us who is right.

We can offer that objectivity, and I think it has a benefit. MAB needs its own identity. This would include a home where we are loved and protected and a budget to let us be about our work.

Thank you.

[The prepared statement of Mr. Fernald follows:]

Statement of
Edward A. Fernald
Director, Institute of Science and Public Affairs
Florida State University
and
Chairman of the Man and the Biosphere Directorate on
Fresh Water Resources
before the Subcommittee on Natural Resources,
Agriculture Research and Environment,
Committee on Science and Technology,
House of Representatives
April 5, 1983

The Man and the Biosphere Directorate on Fresh Water Resources studies the ecological effects of human activities on lakes, marshes, rivers, deltas, estuaries, and the coastal zone. The United States, like all nations, needs better management policies in order to sustain a yield of fresh water in sufficient quantities and quality to meet the present and future needs of its population. Such policies need to be based on knowledge of the scientific, technical, institutional, economic, and cultural aspects of this invaluable resource.

MAB 5-A has been established to stimulate research, training, and information exchange on the impact of human activities on fresh water resources. More specifically, Directorate 5-A (Fresh water resources) is interested in the study of man's perception of fresh water as a resource, his need for that resource, the problems with and potential for data collection and analysis, the impact of institutional laws and policies on fresh water use, and the management and technological tools available to solve fresh water problems. The emphasis of the research and service activities of this Directorate is on the smaller scale, or large area, problems of man's use of water as a resource rather than on the larger scale, more specific small area problems, such as the analysis of detritus (rock particles and other disintegrated matter) in a particular stream. The work of the Directorate is more in the area of applied rather than basic research.

Our goals are:

(1) To develop a conservation ethic to insure an adequate supply of fresh water that will meet man's present and future needs.

(2) To develop a predictive capability for formulating water resource management strategy alternatives. This must be accomplished through interdisciplinary synthesis and integration of existing, as well as new, data.

(3) To identify alternative water management strategies for controlling water supply and pollution sources (point and nonpoint) and to make the alternatives known to the public.

(4) To insure that man's use of fresh water and its associated ecosystems is managed wisely.

MAB 5-A Activities

During the last three years, the fresh water resources directorate has been active in the areas of water management and research. I will discuss briefly some of these activities. Dr. John Cairnes of Virginia Polytechnical Institute has summarized information from several complex scientific studies so that it might be used by local water managers to train their staffs in pollution assessment. He developed a manual for assessing effects of pollution upon species diversity and water ecosystems. This manual was to have been the first of several handbooks for use by decision makers who are faced with implementing water policy or, where necessary, stopping the misuse of the water resource. A second project, not pursued because of lack of funds, was to be the development of a state-of-the-art manual on the subject of river restoration. This project is still needed, as evidenced by the fiscal, utilitarian, and aesthetic costs to society of polluted rivers.

Drs. Robert Livingston and Donald Patton of Florida State University have completed research and are publishing documents, including several books, on fresh water ecosystems. Livingston has done long-term research on the Apalachicola River Valley and the smaller Florida Rivers, the Fenholloway and the Econfina. Several of these studies have been financed by chemical industries in Florida in order to help them better understand their impact on riverine systems. The impact of the Fenholloway, a polluted stream, was compared to the impact of the Econfina, a unpolluted stream, on the marine life productivity in Apalachee Bay. The Apalachicola study is a landmark study of both natural cycles and cultural impacts on a major riverine system.

Dr. Patton headed a study to analyze the principles of watershed function and management in the areas of Lake Okeechobee, the Big Cypress Swamp, and the Everglades. His conclusions will shed significant light on the management of water in this fragile part of the state and will provide methods for restoration and scientific management of these areas. Patton's work also has global implications for scientific watershed management. Dr. Charles Goldman of the University of California, Davis, a MAB Directorate member, heads a research team which has made multiple scientific studies of Lake Tahoe. One of the major objectives of these studies is to establish baseline data for the protection of one of the more beautiful natural resources in the United states.

A lack of funds for planning made it impossible for MAB 5-A to properly coordinate and develop two important water resource studies. The first study was to be a cooperative study with the Man and the Biosphere Committee of Canada. The study was to help establish a management program for coordinating research in the United States and Canada on the problem of pollution in the Great Lakes. A second request came from the Department of Natural Resources in California and a California representative to assist in the analysis of the Mono Lake problem in

California. I feel that Man and the Biosphere is a proper vehicle for doing these kinds of studies and that funds should be made available for such purposes.

In the international arena MAB 5-A has helped fund a study in Guatemala which correlated the serious problem of diarrheal diseases with selected environmental and epidemiological factors during the early weeks of the rainy season. This project not only benefited Guatemala, but it also provided training opportunities for a U.S. medical doctor and several interns from VPI.

Dr. Gordon Chesters, Director of the Water Resources Center of the University of Wisconsin, presently has before the Man and the Biosphere consortium a proposal for the study of man's relationship to the global environment. Chesters's study deals with the excessive erosion and stream sedimentation induced by rapid deforestation as it affects flooding in urban areas of the Phillippines. While this project certainly has transfer value for any of the wet nations of the world, it has specific application to Indonesia and Nepal. Dr. Chesters has already received a commitment from the Phillippines to have two of their MAB scientists work on the program. This is an example of the kind of scientific cooperation that Man and the Biosphere should foster.

The Chairman of the Directorate has developed and tested a water resource decision-making model which provides the professional and nonprofessional alike with a step-by-step process for identifying objectives of water management, establishing criteria for needed research, and evaluating water laws, policies, and regulations, water resource change models, and implementation methodologies. The matrix developed in this decision-making model also takes into consideration the spatial problems of water resource management. This model was tested in an evaluation of Florida water policy and is presently being used in the Florida Legislature in a reevaluation of Florida water law. As a result of this evaluation, a comprehensive water atlas was funded by the Florida Legislature. The water atlas

will provide water professionals and other decision makers in the state with the data they need to make wise water resource decisions. A modest proposal has been enthusiastically accepted by Man and the Biosphere, but unfunded, to develop a methodology that other states or nations could follow for the production of similar water atlases.

A report from a Task Force on Water established by the Speaker of the House of Representatives of the Florida Legislature states that "the potential contamination of ground water by hazardous waste is the single most urgent issue which must be addressed by the legislature in protecting the water resources of the state of Florida." The multidisciplinary team of scientists in the Florida State Hazardous Waste Program recognizes the seriousness of the existing uncontrolled hazardous waste site problem in Florida and the nation. We have completed numerous studies of Florida's water resources which document the seriousness of this problem to both public health and to the environment. Over 200 surface impoundment sites, many of which may contain hazardous waste have already been identified in Florida and this list is not complete. Of these sites 25 have been identified by the EPA as a priority for cleanup under the federal superfund program. Therefore, it would be a great contribution for Man and the Biosphere to develop a program to protect water resources through preventative measures.

A national program to prevent hazardous waste sites could be established for less than $500,000 per year. Savings are obvious when one considers that the superfund cost of cleaning up just one site averages about ten times this number. Local governments do not have the information that they need to handle this problem adequately, and they are unsure of the alternatives available to them for controlling this threat to their water supply. Finally, under the auspices of National MAB, and in cooperation with other agencies, the Directorate on Fresh Water Resources is planning a Hazardous Waste Management Symposium for

Developing and Industrialized Nations. This symposium will bring together nations of the Third World in order to have them work in concert with multinational corporations to develop hazardous waste management procedures to protect the physical and cultural environment of these nations. Indications are that a significant portion of this conference could be funded by the private sector. I have received a letter of support from Dr. Kurt Waldheim, former Secretary-General of the United Nations and a colleague at Florida State University, noting the importance of such a symposium.

Summary

In summary, Man and the Biosphere is primarily an applied science program. It uses the best scientific talent the United States has to offer to resolve societal resource and environmental problems. The program provides agencies at both the state and national level with a broad range of experience and expertise which they would find difficult to obtain in any other way. MAB is a productive way to bring together research scientists from diverse corners of the United States for problem solving and sharing of information. It also provides a mechanism by which U.S. scientists can meet with, and learn from, scientists of other nations.

Thank you for providing this opportunity for me to share with you some of my feelings on a very worthwhile activity, the United States Man and the Biosphere Program.

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DATE OF BIRTH:	January 31, 1932
PRESENT POSITION:	Professor of Geography Director, Institute of Science and Public Affairs Assistant Vice President for Academic Affairs Florida State University Tallahassee, Florida (904) 644-2008
EDUCATION:	Michigan State University, Ph.D., Geography, 1968 Florida State University, M.S., Geography, 1957 Florida State University, B.S., Social Studies Education, 1956

SUMMARY OF ACTIVITIES: Dr. Fernald is Director of the Institute of Science and Public Affairs of Florida State University and Assistant Vice President for Academic Affairs. His areas of specialization are in Land and Resource Use, the Geography of Florida and Geographic Education. He has served on numerous university and state committees, and as a consultant to many state, regional and local agencies in the areas of land planning resource management and social science education. He has served as an expert witness in land use in several Florida courts. Since 1975 he has been the Chairman of the Directorate on Continental Fresh Water Resources of the Man and the Biosphere Program of the U.S. State Department. In that capacity, he has represented the United States and presented papers at three international resource/environmental meetings. He was a consultant to several of the committees which developed elements of the Florida Comprehensive Plan. Dr. Fernald's publications on the resource, environmental and economic situation in Florida are extensive. His professional activities include, among others: President, Florida Society of Geographers; Executive Board, National Council for Geographic Education; Editor of the Florida Geographer. He serves as Chairman of the Tallahassee/Leon County Planning Commission. Dr. Fernald has served as the principal investigator on numerous contracts and grants from local, state and federal government. This work involved studies in the areas of land use, environmental and resource management and analysis. His publications include nine books or monographs, over 20 articles and book chapters and several dozen reports. He has served as principal investigator on over 50 grants or contracts.

Mr. MACKAY. Mr. Beller.

Mr. BELLER. Thank you, Chairman MacKay. I am chairman of MAB's Caribbean Islands Directorate. I am also Chief of the Ocean Programs Branch of the U.S. Environmental Protection Agency.

I want to say first that I am very pleased this committee has asked us to testify. I believe it is highly fitting in view of MAB's mission.

From the point of view of funding, as Dr. Baker indicated, that which MAB receives is microscopic. However, from the point of view of international influence, MAB is very highly rated.

I understand that it is UNESCO's top priority program. I would like to point out that we in MAB are not policymakers. However, we help form the underpinnings on which good policy is based, particularly in the field of science and technology.

We are some of the workers in the forests and arid lands, water resources, islands and such. Or to put it in a broad context, we work in natural resources, agricultural research, and the environment, which is the domain of this committee.

We are, therefore, appreciative of your sympathy and understanding at this hearing. MAB looks at man's relationship to his biosphere from several points of view. For example, there is the resource point of view, which Dr. Fernald has just discussed.

There is the geographic point of view which characterizes the Caribbean Islands Directorate. The several points of view coming together, indeed, give us a better picture than one point of view alone.

We are somewhat like the three blind men and the elephant, which is a fable of Indian folklore, except that unlike these blind men, we do come together, and hopefully we can describe an elephant.

In this view we have three directorates interested in the Caribbean. We have tropical forests, we have biosphere reserves and the one that I am privileged to chair.

We work very closely together. I suspect that through the work of these directorates, this Nation already has in place a strong Caribbean initiative, and I might say at a very low cost.

MAB, as indicated, is interdisciplinary. It is inexpensive. It acts as an amplifier. It work grows more significant with time.

I would like to take as illustrative of this fact the work of the Caribbean Islands Directorate. But first, I would like to give an idea of what the Caribbean Islands are like and what their problems are.

The environmental problems of most of the islands in the Caribbean stem from their having small amounts of natural resources and high population densities.

Grenada, for example, has about 800 people per square mile; Barbados, 1,700; the United States, only 64. Thus, the call on the use of the island resources can be much more severe than on the mainland.

It follows that the island leaders should be much wiser than those on the mainland because they can't afford our mistakes.

There are other problems. Few people on the islands are technically trained. Those that are and succeed to positions of responsibil-

ity often are overburdened with work or eventually move to the mainland for a better standard of living.

Yet, islanders, not unlike mainlanders, face the difficulty having to serve their economic and environmental needs at the same time. A balance is easier to strike on the mainland because they are not as fragile as islands.

In sum, then, there are strong pressures on the natural environment of the Caribbean. There are few experts to consider the impact of the pressures and there is a lessened resistance to these impacts.

At the same time because of the checkered history of the Caribbean, islanders often think of themselves as French or Dutch or Spanish or American and seldom in the Caribbean context.

With this background I would like to turn to the work of the directorate, which, incidentally, is very small. It has only six members. Three live in Puerto Rico, two in the Virgin Islands and one on the mainland.

Yet, they are all quite active. We go back to 1979 when the directorate conceived and then organized with the help of the U.N.'s environment program; that is, UNEP, and others, the Conference on Environmental Management and Economic Growth in the Smaller Caribbean Islands.

If I may, Mr. Chairman, I would like to introduce this into the record.

Delegates from more than a dozen Caribbean islands and from nearly every international donor group participated. It took up cultural issues, ecological issues, and economic issues.

On the small island, everything is interdisciplinary. Let me quickly give you the effects of the conference. The recommendations made by the islanders became priority recommendations in UNEP's action plan for the Caribbean environment program.

This was, indeed, to be expected because the output of the conference was a set of cohesive recommendations made by representatives from a group of Caribbean governments. The top recommendation was for an oil spill contingency plan, which Mr. Phillips noted.

As a result of this recommendation, the directorate sought out the Organization of American States, which was seeking to work with its own constituencies in the Caribbean, suggested we combine forces and work with the entire Caribbean.

The results are easily seen in last week's meeting in Cartagena, Colombia, where they took up the convention dealing with the environmental plan for the wider Caribbean and the protocol for the oil spill contingency plan.

Both of these, in effect, initiated by our directorate. These were signed by the United States, both of them, and by many other nations and they are still open for signature.

Now, what was the cost of this to the United States? My directorate received from MAB, and we were very happy to receive it, $6,000.

We persuaded AID to give us another $22,000. So, for $28,000, the United States had the Conference on Environmental Management and Economic Growth for the Smaller Caribbean Islands and a major input into a major use of the Caribbean Basin.

We have follow-ons. One of the concerns introduced at the Cartagena meeting was the fact that land-based sources of pollution affect the marine environment. This was introduced by the United States. I suspect—rather, I know it also was suggested to the State Department by the Environmental Protection Agency.

It was adopted by UNEP, and the directorate is already responding, responding without any funding, incidentally. The Environmental Protection Agency has agreed to cooperate with MAB to help formulate the Caribbean concerns regarding land-based pollution.

The Environmental Quality Board of Puerto Rico has also agreed to join forces with MAB in order to work out what will later become a protocol for UNEP.

Lastly, and I have not, of course, gone into all our programs, we are arranging a world conference of islands. This is a worldwide extension of Barbados conference. It will deal with the unique problems of islands.

These problems involve the ecological problems, the cultural problems, and the economic. We already have the endorsement of UNESCO, UNEP, and the Organization of American States to proceed with the planning for such a conference.

We believe that it will be as influential for the islands as well as the 1972 U.N. conference was for developing lands in Stockholm. The lands weren't in Stockholm; the meeting was in Stockholm.

This conference will probably be called the Conference in Opportunities and Constraints for Development in Small Oceanic Islands.

Mr. Chairman, that concludes my oral statement. I believe, as Dr. Fernald, we would be pleased to answer questions.

[The prepared statement of Mr. Beller follows:]

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Statement of
William S. Beller
Chairman, U.S. MAB Directorate 7B (Island Ecosystems - Caribbean)
before the Subcommittee on Natural Resources,
Agriculture Research and Environment,
Committee on Science and Technology,
House of Representatives
April 5, 1983

Good morning, Mr. Chairman and Members of the Subcommittee. I am William S. Beller, Chairman of MAB's Caribbean Islands Directorate. I am also Chief, Ocean Programs Branch, U.S. Environmental Protection Agency. I am pleased to be here today to tell you briefly of the work and aims of the Directorate in terms of protecting the environment and ecosystems of Caribbean islands.

The environmental problems of most of the islands in the Caribbean stem from their having small amounts of natural resources and high population densities. Grenada, for example, has about 800 people per square mile, Barbados 1700, the United States, only 64. Thus, the call on the use of island resources can be much more severe than on a mainland.

There are other problems. Few people on the islands are technically trained. Those that are and succeed to positions of responsibility often are over-burdened with work, or eventually move to a mainland for a higher standard of living. As a result, planners on the islands often have little experience in dealing with developments such as industrial, agricultural, and tourism. They cannot easily guide developments to environmental advantage or anticipate their impacts.

Islanders not unlike mainlanders face the difficulty of having to serve their economic and environmental needs at the same time. A balance is easier to strike on mainlands because they are not ecologically as fragile as islands, which lack the diversity in flora and fauna of mainlands. Appalachia in the eastern United States, for example, lost through a blight their chestnut trees in the 1930s. Although the trees were important members of their forest communities, the ecosystems were complex and tolerant enough for other hardwood trees to move into the gap and the forest survived. On islands, deforested areas usually stay that way and result in soil erosion.

In sum, then, there are strong pressures on the natural environment of the Caribbean; there are few experts to consider the impacts of the pressures, and there is a lessened resistance to these impacts. At the same time, because of the checkered history of the Caribbean, islanders often think of themselves as French or Dutch or Spanish or American, and seldom in the Pan-Caribbean context. As a result, Caribbean-wide environmental plans have been difficult to bring about. This situation is beginning to change, especially with the present initiative of the United Nations Environment Programme (UNEP) and its Caribbean Action Plan, which a number of nations addressed late last month at the UNEP meeting in Cartagena, Columbia.

With the foregoing in mind, let me turn to the work of the Caribbean Islands Directorate, and the way it has tried to contribute to the well-being of the islands! The Directorate, purposefully held small, has six members. They know the Caribbean islands very well and have access to resources and people to help carry out the work of the Directorate. The members in addition to myself are: Dr. Juan A. Bonnet, Jr., Director, Center for Energy and Environment Research, University of Puerto Rico; Mr. Pedro Gelabert, Chairman of the Environmental Quality Board of Puerto Rico; Dr. Ariel Lugo, U.S. Department of Agriculture, Forest Service, Puerto Rico; Dr. Allen Putney, Principal Investigator, Eastern Caribbean Natural Area Management Program, U.S. Virgin Islands; and Dr. Edward Towle, President, Island Resources Foundation, U.S. Virgin Islands.

Environmental Management and Economic Growth

During the last week of summer, 1979, representatives from many of the smaller islands in the Caribbean met in Barbados. This was the first time they had ever come together to talk about some of their common problems. It was the first time many had even met one another. What they accomplished is having permanent effects in the Caribbean, and elsewhere.

Delegates of smaller islands came from the governments of the Bahamas, Barbados, British Virgin Islands, Grenada, Montserrat, Netherland Antilles, St. Kitts/Nevis/Anguilla, St. Lucia and St. Vincent. Other participants came from Guyana, Haiti, Mexico, Puerto Rico, Trinidad and Tobago, Venezuela and the United States. In addition, twelve major international donor groups took part in the discussions, including representatives from the World Bank, Organization of American States (OAS), and three offices in the United Nations (UN).

They came to take part in the "Conference on Environmental Management and Economic Growth in the Smaller Caribbean Islands." This meeting was conceived and organized by the Caribbean Islands Directorate. I am going to tell a little about the meeting and what happened afterward because the example shows how MAB works. Then I would like to introduce two other programs of the Directorate to show its widening horizons.

Our Directorate saw difficulty in persuading officials from the various islands to talk solely about environmental protection. "That is good enough for rich countries to do," we'd heard many times, "but what we need in the Caribbean are jobs and industry. When we become rich, we'll worry about pollution." The Directorate later learned that officials from smaller islands do indeed worry very much about their physical environments.

In thinking about the conference, we decided to link environmental matters to economic. In this way, we hoped that the islanders' stake in economic development would lead them to see the need for protecting their environments.

MAB promised us a little seed money. The Agency for International Development (AID) said it would help fund the conference because it wanted to know the islanders' perception of their environmental problems. We invited UNEP to work with us.

Upon UNEP's suggestion, we agreed to concentrate on the smaller islands because the needs and desires of their citizens were not adequately known to UNEP or to any of us. We defined a smaller island as one with an area less than 10,000 square kilometers, and a population less than 500,000. Thus, the conference would concentrate on the issues of islands smaller in area and population than Puerto Rico.

Let me summarize! Three offices of the UN plus the Caribbean Development Bank and U.S. MAB agreed to sponsor the conference, and contribute resources toward it. The entire cost of the conference to MAB was only $6000. AID's contribution was $22,000, which included the cost of publishing the Conference Transactions. The direct cost to the United States was only $28,000.

Here are some of the returns:

- The recommendations made by the islanders became priority recommendations in UNEP's Action Plan for the Caribbean Environment Programme. This was to be expected because the output of the conference was a set of cohesive recommendations made by representatives of a group of Caribbean governments. The recommendations had relevance and a constituency.

- The Conference was timely: it was held to anticipate UNEP's meeting in Venezuela early in 1980 to go over the Caribbean Action Plan. I might note that the elapsed time from the concept for the conference to the publication of its Transactions was only nine months.

- The top recommendation of the conference was that an oil-spill contingency plan be established for the islands in the Caribbean. As a result of this recommendation, a member of the Directorate met with a representative of the Organization of American States (OAS), which had

been working with its own members on such a plan. The two organizations agreed to combine forces to help bring about a Caribbean plan. They submitted a joint proposal to AID, which called for a series of meetings of all the islands. AID approved the proposal, and funded it together with the OAS. Note that MAB in this instance was the catalyst, and contributed ideas but no funds beyond those needed for its own travel and administrative expenses. A number of meetings were subsequently held in the Caribbean as a result of the initiative. UNEP and other international agencies became deeply involved in the effort. The result was the drafting last year of a protocol by UNEP, "Concerning Cooperation in Combating Oil Spills in the Wider Caribbean Region." That Protocol, as well as the Convention for the Caribbean Environment Programme, were submitted for signing late last month at a Conference of Plenipotentiaries.

Caribbean Agriculture

During the 1979 Barbados meeting, when the economists, environmentalists and government officials spoke, they did not address a seminal question: "Are the smaller islands in the Caribbean economically viable?" Many import even their food. Yet if Caribbean islanders would grow their own food, they indeed would be taking a step toward economic independence.

A nation that is expert in drawing abundant crops from sub-marginal lands, even desert lands, is Israel. The Directorate contacted Israeli scientists to see if they would be willing to help the Caribbeans get the most out of their arid and sub-marginal lands. The Directorate spoke to officials from a number of the Caribbean islands and asked if they would be interested in such a workshop. The response on each side was strongly yes. The Directorate then sought to work with the OAS, which is very much interested in Caribbean agriculture. Together, the U.S. MAB and the OAS approached AID, got their encouragement to write a joint proposal with the Israelis, which has been done. We are now waiting for the final results of the submission.

World Island Conference

The Barbados conference dealt with islands in the Caribbean. They have unique problems absorbing the impacts of external forces. These include environmental problems ones such as the introduction of foreign flora and fauna--this done without fully knowing the effects. External forces also include cultural impacts such as those introduced by tourism, television, and the consequent rising expectations engendered in some citizens. Then there are the additional impacts brought about by mainland industries and economics. Meanwhile the islands, characterized by insularity, limited national resources, and lack of ecological and economic redundancies must absorb these impacts without becoming environmentally or politically unstable.

These are problems common to oceanic islands no matter where they are. Our Directorate is suggesting that experts from all small islands come together to address these issues. We believe that such a conference would be as constructive and influential for islands as was the UN Stockholm meeting in 1972 for developing nations.

To this end, the Directorate late last year had a planning meeting inviting to it U.S. experts as well as representatives of UNESCO, OAS, UNEP and UNDP (UN Development Programme). We were pleased to get the endorsement of UNESCO, UNEP, and the OAS to proceed with the planning for such a conference, and assurances that they would cooperate. The conference would build upon what the Directorate did in Barbados, and would probably be called the "Conference on Opportunities and Contraints for Development in Small Oceanic Islands."

Conclusion

I have described MAB as a catalyst that brings about positive reactions at ordinarily would not occur, or that would occur only at a slow rate.

The members of the Directorates work without compensation from MAB. Industry pays them; or a parent organization such as EPA. Members work on MAB because they believe they can accomplish something worthwhile. I believe that everybody gains.

This concludes my prepared remarks. I would be pleased to answer questions.

Background of

WILLIAM S. BELLER

Mr. William S. Beller is chairman of the Caribbean Islands Directorate of the U.S. Man and the Biosphere program. He also heads the Ocean Programs Branch of the U.S. Environmental Protection Agency (EPA). In addition, he is chairman of the interagency Biological Task Force for Georges Bank.

A licensed professional engineer (P.E.) in the State of New York, Mr. Beller holds a B.S. in M.E. from the Georgia Institute of Technology, and an M. of Aero. E. from New York University, where he was la Cierva Memorial Fellow.

His honors include: Meritorious Service Award, Dept. of the Interior; Sustained Superior Service Award (EPA); Honor Award, Dept. of Natural Resources of Puerto Rico; Fellow of the Marine Technology Society and recipient of its Meritorious Service Award; by U.S. House resolution, an expression of appreciation from the former Committee on Science and Astronautics.

In 1969, on the request of the late Governor John Burns, Mr. Beller organized and directed the State-wide effort that led to the report, "Hawaii and the Sea," a broadly based marine program for the State. In 1970, on the request of Governor Melvin Evans, Mr. Beller similarly organized and directed the effort that led to "The U.S. Virgin Islands and the Sea." Governor Luis A. Ferre of Puerto Rico asked for a similar report and program for his island, and Mr. Beller directed the preparation of "Puerto Rico and the Sea." From 1973-1975, he was Coordinator of Marine Affairs for Puerto Rico; in this position, he set up the Office of Alternate Energy, and was appointed its first director.

Mr. Beller is the author of one book, co-author of two, and has published several hundred articles in the field of science and technology. He is a member of the National Press Club.

Born in Cleveland, Ohio, Mr. Beller is married to the former Joan Hirshman, and has three grown children, Nancy, Diane and Stacy. His home is in Bowie, Maryland.

Mr. MACKAY. So, both of you are examples of persons who are active in directorates or specific programs and both of you are functioning as volunteers; is that correct?

Mr. FERNALD. Yes, sir.

Mr. BELLER. That is correct. In my instance, much of my time and much of the members of the directorates' time are volunteered. I would like to add, though, that the Environmental Protection Agency does contribute about 10 percent of my time and some secretarial assistance to MAB's work.

Mr. MACKAY. Now, what is your opinion—well, let me ask this first. How long have each of you been involved in the MAB program?

Mr. FERNALD. Eight years.

Mr. BELLER. I am junior; 6 years.

Mr. MACKAY. But both of you have been there when funding levels were substantially higher than they are now. I would like just your subjective opinions as to where an appropriate level of funding would be and also a brief discussion of how you arrive at that conclusion.

Mr. FERNALD. Mr. Chairman, I would like to make a comment that some of the numbers that you have heard, while they are correct, they are a little misleading in that these numbers include dollars that are given by agencies for specific tasks.

These are not man and the biosphere dollars that are there for the development of a program or development of a specific water resources project, for example.

If we go out and develop a project and then we work hard and take many times an awful lot of time to try to get dollars, and we get that, then it is counted as MAB money, but I don't quite see it that way. We put an awful lot of effort in.

So some of that has to be taken into consideration.

Your question regarding how much funding do I feel, as just my opinion. I feel that even this year, but certainly in the very near future, we could move to a $2 million figure.

This money would be used, I think, in a very worthwhile way. It would be efficient. I would accept all kinds of accountability because we have a program that is one of those that the more you get to know us, the better you will like us.

We can use that as seed money too, in fact, do work that would be valued at several times the $2 million. We could involve more people. From a personal standpoint, there are people that I would like to have involved with my directorate who are very busy, and unless there is some kind of funding there, they really feel like they just can't take the time to become involved with us.

While some of the others are willing to spend the time, you get a negative attitude there, which isn't good. So I feel based on the 1.2, 1.5 that we were developing 1980, 1981, when they asked us what would we do, and we came up with that, even then being a little conservative, I feel almost immediately we could develop a $2 million program which would work toward solving some of the pollution problems and other crises that need immediate attention.

Mr. BELLER. Mr. Chairman, I have not analyzed the overall budget that MAB would require. I can only speak in terms of the needs of the directorate that I am connected with.

I would note that we have been obliged to cut back even the meetings of the directorate from twice a year to just about once a year.

I would also note that for the world conference that I just described, although it looks like we can get funding to carry out much of the work, the establishment of a secretariat, a strong secretariat to help us do this, is nonexistent.

I suggest that if the United States could take a leading role in setting up such a meeting, it would accrue to the benefit of the United States.

I might observe that small islands of the United Nations—and this is purely a random thought—are one out of six. That is a good constituency.

Mr. MACKAY. Puerto Rico is an unusual country in that it has a strong relationship with the United States and yet it is separate. What role do you see Puerto Rico playing in this whole MAB's island initiative.

Mr. BELLER. I think, Mr. Chairman, in your statement of the question, you have virtually answered it quite astutely. The fact that Puerto Rico clearly is in the Caribbean and embedded in the culture of the Caribbean makes Puerto Rico and exceptionally fine spokesman for the United States, or there might be a question that the United States does not understand much of the culture there.

The Puerto Ricans certainly understand the culture. They are training many of the Caribbeans, and I believe they can help this Nation.

Mr. MACKAY. I would like to state to you and also the other witnesses, there may be other questions that arise as we get this together and start trying to assimilate it. So we may ask you for additional information for the record and would appreciate that very much.

I don't mean to cut you off. If either of you have any further comments, I would be very pleased to hear them.

Mr. FERNALD. We appreciate the opportunity to testify.

Mr. MACKAY. Thank you. This has been very helpful to me, and I can only say that I wish we had other subcommittee members here. I perceive part of your problem being the problem of lack of advocacy within the Congress, and part of that comes because you really don't fit within anybody's jurisdictional boundaries.

Witness the fact that this committee is holding what amounts to an oversight hearing to make recommendations to another committee which will consider the budget issue. You just don't fit in anybody's tidy jurisdictional boundaries. I can see your frustration from that.

Thank you very much for being here.

Mr. MACKAY. Our next panel includes Dr. Gregg, Dr. Wiersma, and Dr. Clark. I very much appreciate your being here and would appreciate any comments you would care to make verbally in the way of a summary. We will file your written testimony as part of the report of this subcommittee.

Dr. Clark, I will start with you and then we will proceed to the right.

STATEMENTS OF BRYAN CLARK, USDA FOREST SERVICE; WILLIAM GREGG, DEPARTMENT OF THE INTERIOR; AND C. BRUCE WIERSMA, IDAHO NATIONAL ENGINEERING LABORATORY

Dr. CLARK. Thank you for the opportunity to be here this afternoon. I would like to briefly explain the Forest Service's involvement in the program and then address our participation in two of the program's directorates.

Within MAB, the Forest Service has been active primarily in research on temporate forest and tropical forest ecosystems and in the establishment of biosphere reserves.

These are three areas where our mission complements the objectives of MAB and where our participation in MAB has helped us achieve mission objectives in research, international forestry, and the conservation and management of natural resources.

We have also been active within MAB in research on grazing lands and mountain and arctic ecosystems. Many of our research scientists have participated directly in MAB field research projects, often in cooperation with research scientists from universities or from other governmental agencies.

Currently 10 of our research staff serve on MAB directorates. Further, the Forest Service has assigned members of its research staff on a full-time and part-time basis to assist the MAB Secretariat in the State Department here in the United States and also in Paris.

Our membership in MAB has aided our cooperation with other agencies and institutions in the United States. For example, we helped establish the consortium for the study of man's relationship with global environment in 1979.

We have participated with the National Park Service and other agencies in funding research through this consortium on areas of mutual interest.

Most of this research is carried out by universities, often in close cooperation with our scientists. Their activities have been a direct benefit to the accomplishment of our own mission.

Two areas of MAB are of particular interest to us, the use of biosphere reserves for conservation of forest genetic resources and activities of the U.S. MAB Directorate on Tropical Forests.

One of the most important, active project areas in MAB is the biosphere reserve program that Dr. Gregg will talk about in just a few minutes.

Biosphere reserves provide a unique opportunity for conserving large areas and thus for certain forest types a method for maintaining unusual, as well as conventional forest ecosystems.

Such forested areas provide a genetic reserve. Forestry has learned from the unfortunate experiences of agriculture, wherein some of the original genetic material has been lost. Therefore, forestry is attempting to maintain a reliable and highly varied genetic reservoir for future use and possible genetic improvements.

Maintaining an adequate diversity of the forest genetic resource provides an opportunity to respond to natural catastrophies by restoring forest stands.

The same genetic diversity also is needed for developing new combinations to produce individuals that are better adapted to specific environmental situations.

By providing for the conservation of the genetic resource, the biosphere reserves contribute to achieving these goals. To the researchers and foresters interested in the maintenance and long-term genetic improvement of forest crops, biosphere reserves offer a new opportunity to advance the science of forest improvement by insuring a breeding population and a much needed safeguard for maintaining genetic diversity of forests subjected to intensive forest management.

Now, on tropical forests. Since the 1960's, the proportion of the world's round wood production contributed by the tropics has increased from about 25 percent to over 40 percent today.

Eighty percent of this production satisfies energy needs. The rest supplies world markets for fine tropical woods. Tropical forests also supply protein, water, recreational activities and other amenities for the peoples in the tropics.

In the United States, our Caribbean National Forest in Puerto Rico attracts well over a million recreation visitors a year and provides clean water for much of the population in Puerto Rico. In addition, a significant fraction of our existing pharmaceuticals are derived from tropical species.

Because every year about 7½ million hectares of tropical forests are lost, and because tropical forests support some of the richest and still undisturbed assemblages of plant and animal species in the planet, there is a worldwide concern about the future of this valuable global resource.

The U.S. MAB program through its directorate on tropical forests concerns itself with the complex task of trying to understand how tropical forests work, and how they can best be managed to meet human needs.

The principal research objectives of MAB–1 directorate is to foster an understanding of the roles of people in tropical forest ecosystems. Some examples: the ecology of dry tropical forests; techniques for the restoration of productive capacities of devastated sites caused by overgrazing, fire, destructive logging and other misuses of the land; economic and environmental costs and benefits of tree plantations.

About 20 MAB studies in tropical forests have been funded over the past 7 years with a total cost of $870,000. This is direct cost and does not include contributed costs of some of the institutions involved.

On the border between the Amazon Brazilian jungle and the dry, impoverished northeast, scientists from the University of Florida studied the relationship between a palm and the population in the region.

This palm was considered a weed. Through a study of the palm's ecology and its multiple uses by local people, techniques for its management and care were developed. This MAB study helped change social attitudes, developed new technology and contributed to better use of a local resource.

The study in the Loquillo experimental forest and biosphere reserve in Puerto Rico aims at ways of managing natural forests for timber products, wood for novelties and watershed protection.

In another study in the same area, comparisons are made between the natural forest and plantations established under similar conditions.

The directorate has also sponsored a number of conferences and workshops, including one last year of Caribbean foresters. With a total investment of $9,000, we were able to gather 50 foresters from some 10 islands and 5 countries for a week of discussions.

As a result, the Caribbean Forester Society has been organized and is supported by the International Society of Tropical Foresters. The proceedings of this conference have been published. With your permission, I would like to submit it for the record.

[The information follows:]

MAB newsletter

UNESCO'S MAN AND THE BIOSPHERE PROGRAM

U.S. MAN AND THE BIOSPHERE PROGRAM

The Man and the Biosphere Program (MAB) of UNESCO was established in 1971 as an international effort to improve the management of the world's natural resources through scientific research, education and training. It is one of the few scientific organizations in the world that operates as a voluntary cooperative effort between government agencies and the scientific community. MAB is acknowledged to be a productive, cost effective program and has been singled out by the UNESCO General Conference as a model to be followed by other international programs.

The United States was instrumental in the establishment of the Man and the Biosphere Program and has been a major participant in the Program. The U.S. holds one of the four vice presidencies of the 30-nation International Coordinating Council (ICC) and as such is a member of the MAB Bureau.

The U.S. National Committee for MAB, which is a major committee of the U.S. National Commission for UNESCO, has members drawn from private and public sector organizations. The Committee provides oversight and guidance for the MAB activities.

The scientific activities which comprise the U.S. MAB Program are developed and implemented by 135 scientists and resource managers organized into directorates, e.g., the directorate for tropical forests. These professionals volunteer their time and energy to MAB; their salaries and basic support are provided by their respective organizations.

Financial support for U.S. MAB and staffing for the Secretariat have been provided by a number of federal agencies, with the Departments of Agriculture, Interior and State being the principal supporters. In FY-82, funding for MAB Program activities (including an AID/MAB contract) was $466,000, down from $660,000 in FY-81. FY-83 funding will be approximately $90,000 plus an unknown amount for the research consortium.

The MAB Secretariat, collocated with the Secretariat of the National Commission for UNESCO, consists of a part-time director (State), a GS-9 four-day per week Conference Officer (State), a part-time GS-15 forestry professional assigned to the Secretariat by the U.S. Forest Service, and a GS-5 four-day per week secretary (State). In the past, the National Park Service and U.S. Forest

Service provided personnel support for the MAB Secretariat in Paris. In addition, the National Park Service of the Department of Interior has designated a full-time MAB coordinator to coordinate participation in the MAB Program.

The MAB Research Program

Research is an important component of the MAB Program. In the United States, MAB's research effort is facilitated through the Consortium for the Study of Man's Relationship with the Global Environment. Under the Consortium, which has been supported in a major way by the U.S. Forest Service and National Park Service, MAB has funded 37 research projects currently worth approximately $1,900,000. Grants are made for varying periods of time but not to exceed three years. Seventy-five percent of these research projects involve work in and cooperation with other countries ranging from Zaire to Indonesia to Costa Rica; i.e., largely developing countries. The first grants were made in 1979. Last year, 139 proposals were received but only 4 could be funded. Funding for 1983 projects is uncertain.

Scientific Conferences

Bringing scientists, resource managers and decision makers together to examine and share information is another major activity of MAB. In 1982, U.S. MAB provided full or partial support for 21 scientific meetings. Commitments to support scientific conferences and symposia are generally made one to two years in advance, and a year of followup is normally required to ensure that reports are prepared and disseminated. MAB gave, or will give, support to the following conferences in 1982 and 1983:

-- Tropical Forestry Workshop for Caribbean Islands Foresters, St. Lucia, May 24-28, 1982.

-- Urban Ecosystems Conference, Miami, May 20-22, 1982.

-- International Symposium, "Application of Genetics to the Management of Wild Plant and Animal Populations," Washington, August 9-13, 1982.

-- Conference on the "Impacts of Limited Water for Irrigation in the Arid West," Monterey, California, September 28-October 1, 1982.

-- U.S.-Mexico Workshop on "Social Implications of Environmental Problems," Rio Rico, Arizona, March 9-11, 1983.

-- Workshop on "Outlying Forests for Metropolitan Populations," Milwaukee, Wisconsin, May 16-17, 1983.

-- Workshop "Determining a Methodology for Analyzing the Development of Small Ocean Islands," Puerto Rico, late 1983.

-- "Hazardous Waste Management Symposium for Developing and Industrialized Nations," Geneva, fall 1984 (tentative).

Special Projects

Management of Island Resources: The Experience of the U.S. Virgin Islands. This project, initiated by the Caribbean Islands Directorate, MAB-7B, is

designed to produce information that will be useful to other Caribbean islands in the management of their natural resources.

MAB/Peace Corps/Forest Service Reforestation Manual for Central and Latin America. Under this cooperative project, the Institute of Tropical Forestry is preparing a manual for use by Peace Corps volunteers and forestry organizations in Latin American countries to guide them in carrying out much needed reforestation programs. MAB is obligated to produce 1,500 copies of the manual in English and 1,500 copies in Spanish. Thus far, $11,000 has been obligated for the manual, exclusive of printing costs.

Biosphere Reserves

Biosphere Reserves are areas of unique natural significance especially designated for study and monitoring of the changes that natural systems are undergoing throughout the world. To date, UNESCO has approved the designation of 215 Biosphere Reserves in 58 countries.

The U.S. has 37 reserves. However, this number is insufficient to provide adequate representation of major ecosystem types in the U.S. U.S. MAB has begun a systematic effort to complete the Biosphere Reserve network in the U.S. by convening panels of scientists to evaluate and nominate potential sites. If work proceeds as planned, the U.S. network will be completed by 1984. Funding for this project has been provided by the U.S. National Park Service and the U.S. Forest Service.

Comprehensive Assessment Studies of U.S. Biosphere Reserves

In October 1981, a comprehensive assessment of scientific information available about the Great Smoky Mountains Biosphere Reserve was completed. This effort which involved more than 90 scientists was funded for MAB by the National Park Service. Similar assessments are in progress/completed for six additional areas including Isle Royale, Glacier, Channel Islands, and Organ Pipe Cactus Biosphere Reserves.

World Conference on Biosphere Reserves

The MAB Program of UNESCO and the UN Environment Program (UNEP) are organizing a World Conference on Biosphere Reserves to take place in Minsk, USSR, in the fall of 1983. The purposes of the conference are to assess the status of the global Biosphere Reserve system and to stimulate the utilization of Biosphere Reserves for research, baseline studies and monitoring. The United States is a member of the conference planning committee and a U.S. representative participated in a planning session in the USSR.

US-USSR Biosphere Reserve Agreement

Under the terms of the US-USSR Environment Agreement, U.S. MAB and MAB of the Soviet Union are cooperating in the use of Biosphere Reserves for environmental monitoring. Matched pairs of Biosphere Reserves have been designated and

exchanges of scientists have taken place. A U.S. team visited the USSR in August, 1982, to calibrate monitoring equipment. A Soviet team is scheduled to visit the U.S. in 1983. This project has no termination date.

US-Mexico and US-Canada Biosphere Reserve Programs

U.S. MAB is cooperating with Canada and Mexico through the exchange of data from and cooperative research in contiguous Biosphere Reserves in the three countries. These projects have no termination date.

Cooperation with Other Countries

The U.S. is joined with Canada, Denmark, Finland, Norway, Sweden and the USSR in a "Network of Cooperation in Northern Science." Under this cooperative arrangement, participating nations share information about and conduct joint studies of boreal and arctic ecosystems. This project has no completion date.

US-Mexico Arid Lands Agreement

The U.S. MAB Program is one of the vehicles for implementing this agreement.

Publications

The following scientific reports are but a few which are (or will soon be) available from the U.S. MAB Secretariat:

-- Proceedings of the conference on "The Consequences of Migration in the Pacific Basin" (to be published).

-- "A Decision-making Process for Water Resources Allocation."

-- State-of-the-art report on "Environmental Perception and Tourism."

-- "Guidelines for the Selection of Biosphere Reserves, An Interim Report and Key." U.S. MAB Publication No. 1.

-- "Understanding Marine Ecosystems in the Gulf of Mexico." U.S. MAB Report No. 2.

-- "Pollution Assessment: A Training Manual." U.S. MAB Handbook No. 1.

U.S. MAB also coordinated the preparation of a report for UNESCO by the Center for Environmental Education on institutional mechanisms established in the United States for the development of environmental education at the national level.

U.S. MAB maintains a supply of 120 scientific publications associated with the Man and the Biosphere Program in order to respond to approximately 100 requests for publications per month.

AID/MAB Contract

In 1977, the Agency for International Development and U.S. MAB entered into a $1,200,000 contractual agreement whereby MAB would develop training courses and

information and support materials for AID in fields of environment and natural resources management. Under this contract, which ended on June 30, 1982, MAB developed resource profiles for 47 developing countries; a "Watershed Management Training Course" was presented in Asia and Central America; and a course in "Environmental Analyses for Management of Tropical Forests and Related Natural Resources" was offered.

Four important guidelines for development studies have been completed: one on the economic and other values of protected areas to developing countries; a second on the values of wildlife; a third on the minimum critical size of habitats; and a fourth on environmental guidelines for irrigation.

January 31, 1983

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MAB-8 (Biosphere Reserves/Conservation of Natural Areas and of the Genetic Material they Contain)

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MAB-9 (Pesticides Management)
INACTIVE DIRECTORATE
Dr. Virgil Freed

MAB-10 (Major Engineering Works)
INACTIVE DIRECTORATE
Dr. Charles P. Wolf

MAB-11 (Urban Ecosystems)

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MAB-12 (Demographic Changes)

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MAB-13 (Perception of Environmental Quality)

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MAB-14 (Pollution)

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SUMMARY OF SELECTED
MAB DIRECTORATE ACTIVITIES

MAB-1	Tropical Forests
MAB-2	Temperate Forests
MAB-3	Grazing Lands
MAB-4	Arid Zones
MAB-5a	Fresh Water Resources
MAB-6b	Arctic
MAB-7b	Island Ecosystems - Caribbean
MAB-8	Biosphere Reserves/Conservation of Natural Areas and of the Genetic Material they Contain
MAB-11	Urban Ecosystems
MAB-12	Demographic Changes
MAB-13	Perception of Environmental Quality
MAB-14	Pollution

Summary of Activities of MAB Directorate No. 1
on Tropical Forest Ecosystems

This directorate of 9 members is concerned with how tropical forests function and how they can be managed to meet human needs.

The directorate conducts and sponsors research on:

- the ecology of dry tropical forests, related fuelwood shortages, and associated site degradation;
- techniques for restoring sites devastated by overgrazing, fire, excessive logging, or other misuse;
- ecological and social implications of the conversion of tropical forests to cropland and pasture;
- economic and environmental costs and benefits of tree plantations.

The directorate has sponsored workshops and symposia. A meeting of Caribbean foresters led to:

- formation of a regional professional forestry society
- identification of six priority activities for Caribbean forestry
- a document summarizing the state of regional forestry knowledge
- a research and training grant toward the Caribbean Environmental Action Plan of UNEP.

A symposium on plantations for wood production in the new-world tropics led to:

- knowledge that plantations can outproduce natural forests 10 to 1 for wood
- a sharing of new techniques for plantation establishment
- identification of new management alternatives and research needs

The directorate synthesizes and compiles existing knowledge on tropical forest management for human needs, including:

- a global assessment of the condition of mangrove forests,
- a manual of techniques for reforestation for Peace Corps use in tropical Latin America

In summary, the MAB tropical forests directorate is a small group of people trying very hard to combine their talents with available financial and scientific resources for the promotion of one idea: that humans and the tropical forest can coexist productively through better knowledge of the immense variety of opportunities that these forests offer.

MAB PROJECT 2

TEMPERATE FORESTS

Temperate forests include a wide range of ecosystems, from high elevation conifers to broad leafed, mixed deciduous, and evergreen forests. Throughout the world, these forests have important ecological, economic, and social effects on human populations living in or adjacent to these regions. However, large areas of these forests have been cleared for agriculture, urbanization, lumber, pulpwood, and fuel. To ensure wise use of temperate forests, there is a pressing need for new research findings, and the assimilation of existing information so as to evaluate man's impacts on these forests. It is to these ends that the Man and the Biosphere (MAB) Project II, Temperate Forests, addresses itself.

MAB Project II is broadly concerned internationally with the study of ecological and socioeconomic effects of alternative land uses and managerial practices in temperate, mediterranean, and boreal forests. In the United States, the Directorate of MAB Project II has identified specific areas of interdisciplinary collaboration, including the study of: environmental impacts of wildfire and fuelwood management policies; effects of energy development technologies on forest landscapes; applications of ecological knowledge in the land use planning process; ecological and socioeconomic consequences of intensive forest management practices; and accumulation, analysis, and transfer of information relating to temperate, mediterranean, and boreal forests.

Recent and proposed activities of the Directorate in meeting the goals of MAB Project II in the United States are many. Importantly, interdisciplinary collaboration among scientists, managers, and decision-makers concerned with wise use and conservation of the biosphere has been, and continues to be highlighted.

A need to develop an understanding of dynamics of devasting wildfires in mediterranean regions (e.g., southern California) led to an international symposium on the Environmental Consequences of Fire and Fuel Management in Mediterranean Ecosystems. To consider the use of forest resources as fuel sources, an international workshop on the Biological and Sociological Basis for a Rational Use of Forest Resources for Energy has been conducted. As a follow-up to this workshop, the Directorate of MAB Project II is completing an investigation on the potential use of noncommercial forest species for energy biomass, a topic previously not investigated. To further the understanding of multiple use of temperate forest resources, a milestone conference on Research on Multiple Use of Forest Resources was sponsored by MAB Project II and others. Internationally, a number of important activities are underway, including, of particular note: a binational Mexico-USA program of research and education, entitled Comparative Studies of Dry Forests in Western North America. One of the more significant accomplishments of this binational program was an international seminar, in which over 65 upper level policy-makers from Mexico, Central America, and the United States examined the Social and Environmental Consequences of Natural Resources Policies on the livelihood of people dependent on natural resources. In the future, as in the past, activities in which MAB Project II is involved will be structured along two principal themes: interdisciplinary collaboration among people concerned with the environment, and joint research among the many other countries with MAB Project II programs.

GRAZING LANDS DIRECTORATE (MAB-3)

Grazing lands comprise a large portion of the earth's land area where climate, physiography and soils constrain vegetative development to hebaceous and shrubby types. Cultivated agriculture is frequently infeasible in such regions, and traditionally the highest use of the land for human welfare has been the production of such animal products as meat, fiber and hides. In developed countries such as the United States, there is an increasing demand for multiple uses of grazing lands. Food production from grazing animals will be one of many uses. Other uses include recreation, wildlife and fish production, energy and mineral development, water (quality and quantity), and timber products. Management of the land must involve trade-offs to attempt to balance these uses to best meet the needs of the people.

To address these and other issues the U.S. MAB-3 Directorate has focused its attention toward two areas: 1) the development of management policies and procedures which will increase production of animal products from grazing lands, and 2) the illumination and resolution of issues that arise from multiple uses of grazing lands.

Ongoing Directorate activities include a Southern Evaluation Project of the Range and Related Resource Evaluation Program (SEP). Objectives of this project are to evaluate impacts of timber, wildlife, and range management alternatives from a biological, physical, economic, and social standpoint; to provide technology transfer to private and public land owners and managers; to demonstrate selected management levels on an operational scale.

A special session on "Range Improvements- Today and Tomorrow" has been developed for presentation at the 1983 annual meeting of the Society for Range Management. This session is to address non-biological factors which influence decisions on use of range improvement practices. MAB-3 is also assisting in organizing a special session for the 2ND International Rangeland Congress to be held in Adelaide, Australia, in May 1984. Preceedings from both sessions will be published under MAB auspices for separate distributiion. Other publications include a Directory of Social Scientists for Rangeland Peoples and the proceedings of a special session on international students conducted at the XIV International Grassland Congress.

MAB-3 is also interested in working with MAB-1 to develop a workshop on Silvipastoral Systems in the Tropics. This activity is to identify problems and opportunities associated with livestock grazing on forested lands in the tropics, and to advance possible solutions for dealing with the problems.

MAB PROJECT 4
ARID ZONES DIRECTORATE

The focus of the Arid Zone Directorate for several years has been on the possible consequences of population and economic growth in the arid regions of Western United States in the face of their limited water supplies. Is the West heading into a "water crisis" as a result of such growth? Or, do governmental and private institutions possess adequate mechanisms for change in water uses by which crises might be avoided? What could be the consequences on Western agriculture (which now uses the bulk of the available water) as a result of continued substantial urban and industrial growth? Finally, what could be the economic, social and environmental consequences of such change?

The Directorate organized an interdisciplinary conference on Impacts of Limited Water for Agriculture in the Arid West to address these questions. The Conference was held September 28 - October 1, 1982 at Asilomar Conference Center, California, with some 200 participants from universities, government and private business and with the support of both private and public funds. A proceedings of the conference is now being prepared for publication by the University of California Press in 1983 for widespread distribution.

MAB 5-A

FRESH WATER RESOURCES

GENERAL:

This directorate of 8 members is concerned with the ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries, and coastal zones. The directorate works to stimulate research, training, and information exchange.

It is particularly interested in the study of man's perception of fresh water as a resource, his need for that resource, the problems with and potential for data collection and analysis, the impact of institutional laws and policies on fresh water use, and the management and technological tools available to solve fresh water problems. The work of the Directorate is more in the area of applied rather than basic research.

ACTIVITIES:

-Preparation of a manual for assessing the effects of pollution upon species diversity in water ecosystems for use by decision-makers who are faced with implementing water policy or, where necessary, stopping the misuse of the water resource.

-Research on fresh water ecosystems, including the impact of chemical industries on marine life productivity in riverine systems. Areas include the Apalachicola River Valley, Apolachee Bay, and the Fenholloway and Econfina Rivers in Florida.

-Study on the principles of watershed function and management in the areas of Lake Okeechobee, the Big Cypress Swamp, and the Everglades to provide methods for restoration and scientific management of these areas, and to establish baseline data for the protection of natural resources.

-Co-sponsored a study in Guatemala to correlate the serious problem of diarrheal diseases with selected environmental and epidemiological factors during the early weeks of the rainy season.

-Development and testing of a water resource decision-making model which provides the professional and non-professional alike with a step-by-step process for identifying objectives of water management, establishing criteria for needed research, and evaluating water laws, policies, and regulations, water resource change models, and implementation methodologies.

-Planning for a Hazardous Waste Management Symposium for Developing and Industrialized Nations.

Arctic Regional Directorate (6-b)

United States Man and the Biosphere Program

January 1983

In original US-MAB activities, high-latitude lands (both subarctic and Arctic) had been lumped with mountain environments (MAB 6). In the mid-1970's it became apparent that the high-latitude activities of US-MAB, which focused on Alaska and the circumpolar north, would be better served by establishing a separate Directorate; this was approved by the US-MAB National Committee in 1977.

While "new money" directly from the US-MAB program (or, more recently, the "Consortium...") has been lacking, the Arctic Regional Directorate has engaged in a number of independently-funded activities which have been dependent on or have benefited from the Man and the Biosphere program. The emphasis has been on northern resource use and ecosystem relationships, with concentration on domestic and wild grazing animals—reindeer, caribou, and muskoxen. These concerns are of circumpolar importance, and MAB-6b activities are being undertaken in cooperation with other northern countries—Denmark, Greenland, Norway, Sweden, Canada, USSR. Examples of past and current work include:

(1) Mt. McKinley National Park Caribou Ecology and Management,

(2) Porcupine Caribou Herd—International Management and Research,

(3) Man in the Arctic Socio-economic Research Program,

(4) Research and Extension in the Alaska Reindeer Industry,

(5) Biology of Muskoxen in Arctic Ranges: Implications for Impact by Development.

(6) International Cooperative Studies, Information Exchange and Student Training, including (a) comparison of ungulate grazing: Svalbard/Alaska animal and range comparisons; (b) circumpolar comparison of grazing ranges of reindeer, caribou and muskoxen (Greenland, Canada, USA); (c) participation in 2nd International Reindeer/Caribou Symposium, Røros, Norway, 1979 (d) participation in Swedish-MAB study of land use in northern Sweden.

(7) The First International Muskox Symposium, 25-27 May 1983, is being partially supported by UNESCO-MAB.

A great amount of research related to northern land use was accomplished under the MAB-initiated, NSF-funded RATE program (Research in Arctic Tundra Environments), 1975-1978, which dealt with herbivory on the Arctic Coastal Plain—scene of accelerating energy-related development.

The Biosphere Reserve program (MAB-8) currently includes three Alaskan sites, although high-latitude ecosystems are not yet adequately represented. MAB 6b activities related to biosphere reserves include a currently underway Sitkan biogeographic province site selection process, analysis of "Research Potentials of Alaskan Biosphere Reserves, nd study of the ecological role of fire in tundra ecosystems of the Noatak Biosphere Reserve. Proposals have been prepared for concurrent monitoring of precipitation chemistry in Mt. McKinley National Park Biosphere Reserve and in a taiga Experimental Ecological Reserve, and for study of ecological and socio-economic consequences of grazing in tundra systems represented in the Noatak Biosphere Reserve. MAB 6-b is currently cooperating with the Canadian MAB program, as well as UNESCO (Paris) MAB, in a new "Northern Science Networks" initiative which includes attention to (1) subarctic birch forest management and ecology (2) development of, a d monitoring and research in, biosphere reserves and other protected areas in high latitudes, and (3) land use practices and grazing animals.

MAB 6-b Arctic Regional Directorate members have found the Man and the Biosphere program extremely valuable in implementing circumpolar, international resource and ecosystems analysis programs. Our view is circumpolar. The resources, the ecosystems, and the severe environmental constraints on resource use and ecosystem productivity are circumpolar. We are of necessity (and to the benefit of US knowledge) involved in communication and cooperation with other northern countries, their scientists and their indigenous people.

Charles W. Slaughter

CHARLES W. SLAUGHTER
Chairman, Arctic Regional Directorate
907-474-6710

SUMMARY OF ACTIVITIES OF

CARIBBEAN ISLANDS DIRECTORATE (MAB 7B)

The Caribbean Islands Directorate, whose members are mostly from the islands, works to help islanders understand their unique lands and to develop them in the most healthful way.

Accomplishments

Listed are some of the more important activities and reports coming from the Directorate, or in which the Directorate participated:

- Conceived and organized the "Conference on Environmental Management and Economic Growth in the Smaller Caribbean Islands," Barbados, September 17-21, 1979. Published the Transactions (Dept. of State Publication 8996, November 1979. Also, U.S. GPO.)

  + Conference recommended [illegible] ame part of the UNEP's proposed "Convention for the [illegible] Environment Programme."

  + Oil-spill recommendation resulted in UNEP's proposed "Protocol Concerning Cooperation in Combating Oil Spills in the Wider Caribbean Area."

- Conceived and recommended formation of the "Caribbean Institute for Resource Management," which became an active instrumentality of the University of Puerto Rico (1981) to train Caribbean technicians.

- Conceived, organized, and worked out a partnership with the Organization of American States and others for designing an oil-spill contingency plan for all the islands in the Caribbean. One of the results: "Meeting of Caribbean Islands on Oil Spill Contingency Planning," Barbados, November 1980. Sponsored by OAS, IMCO, UNEP, U.S. MAB. Published by Inter-Governmental Maritime Consultative Organization, London, 1980.

- "Island Resource Management: The Virgin Islands' Experience," a planning study for a workshop on environmental assessment, resource allocation, carrying capacity, growth management, and enhancing information transfer for decision-making in smaller islands, U.S. MAB, Edward L. Towle et. al., Island Resources Foundation, U.S. Virgin Islands, October 1982.

- "Caribbean Island Resource Management," an annotated bibliography of source material focussing on the U.S. Virgin Islands' experience and its Eastern Caribbean context, U.S. MAB, Edward L. Towle and A. Robert Teytaud, Island Resources Foundation, U.S. Virgin Islands, September 1982.

- Solid Waste Management in the Lesser Antilles," a status report and planning study, U.S. MAB, Edward L. Towle, Island Resources Foundation, U.S. Virgin Islands, June 1982.

For the Future

The Directorate is currently planning:

- A meeting of experts knowledgeable about islands, followed by a worldwide government-to-government meeting, called the "Conference on Opportunities and Contraints for Development in Small Oceanic Islands."

- An arid lands workshop in the Caribbean, led by Israeli soil scientists. Co-sponsored by U.S. MAB, and the OAS, and funded by AID.

- A workshop of Caribbean planning experts, in cooperation with NOAA, which would consider methods for establishing marine protected areas, held on the island of Mona (near Puerto Rico), in the spring of 1983. (This meeting ties in with a symposium organized by MAB Directorate on Biosphere Reserves, which will meet on St. Johns, U.S. Virgin Islands.)

MAB-8 - BIOSPHERE RESERVES: CONSERVATION OF NATURAL AREAS AND THE GENETIC MATERIAL THEY CONTAIN

Principal Interests of the Directorate

- Conservation and management of genetic resources.
- Developing the scientific basis for selecting protected natural areas.
- Completing the domestic network of biosphere reserves.
- Encouraging scientific use of biosphere reserves to improve understanding of natural and managed ecosystems, and to support the integrated development of ecological regions.
- International scientific collaboration involving biosphere reserves.
- Demonstration and training projects involving biosphere reserves.

Representation on the Project Directorate

Forest Service
Bureau of Land Management
National Park Service
U.S. Fish and Wildlife Service
U.S. Geological Survey
The Nature Conservancy
Society of American Foresters
Department of Energy
Illinois Natural History Survey
University scientists

Selected Accomplishments 1980-1982

Symposia and Workshops

- Application of Genetics in the Management of Wild Plant and Animal Populations. Intended to promote communication between scientists and managers of genetic resources. Textbook based on proceedings to be published in 1983.
- U.S.-Canadian Symposium on Biosphere Reserves. A bilateral symposium exploring the role of biosphere reserves in sustainable conservation of ecosystems on a regional basis. Proceedings to be published in 1983.
- Communication to the Public in Biosphere Reserves. Workshop resulted in a published guideline for managers to help achieve an important mission of biosphere reserves.

Basic Reference Series on the History of Scientific Studies in Biosphere Reserves. Initiated in 1981 to facilitate scientific use and collaboration, and for training of reserve personnel. Volumes are completed or in progress for seven reserves.

Selection of Biosphere Reserves. Systematic review of the nation's ecological regions by ad hoc interdisciplinary panels of scientists. Separate reviews are made for coastal and non-coastal areas. Each year these reviews result in the addition of new sites to the U.S. network, which presently consist of 37 biosphere reserves in 17 of the nation's 20 ecological regions.

Demonstration Projects.

- Applications of remote sensing and digital cartography in biosphere reserve management.
- Ethnobotany of a biosphere reserve.
- Ecological modelling applications.

Bilateral Projects.

- U.S.S.R. (ecological monitoring)
- Costa Rica (ecological research)
- Brazil (design of reserves)
- Mexico (scientific collaboration in border-area biosphere reserves)
- India (conservation of biological diversity and biosphere reserves)

Planned Projects in 1983

- Symposium and Workshop on Biosphere Reserves and Other Protected Areas for Conservation in the Smaller Islands of the Caribbean Basin (May 1983, USVI)
- International Training Seminar on the Management of Large Wetland Biosphere Reserves (mid-1983, at Everglades National Park Biosphere Reserve)
- Nomination of first multiple site biosphere reserve linking important ecological research sites under different administrators (proposed Calif. Coast Ranges Biosphere Reserve containing sites under 7 administrators. Pending approval.)

ECOLOGICAL ASPECTS OF URBAN SYSTEMS WITH PARTICULAR EMPHASIS ON ENERGY UTILIZATION (URBAN ECOSYSTEMS)

MAB-11

The MAB-11 Directorate is concerned with ecological aspects of urban systems. The approach followed by the Directorate since 1979 has been one of regarding human settlements patterns of urban areas as a special ecological form interacting with the natural ecology of urban places and their environments. Urban ecosystems are therefore regarded as part of their natural environment and part of the social environment. In the latter capacity, they play an important role in human production and consumption, and therefore in social welfare.

The MAB-11 Directorate has conducted a number of meetings in the past three years where activities have been crystallized in four general directions.

First, the Directorate decided that one of its important functions was to explore the issues, concepts and methods of work arising out of the desire to integrate the treatment of the two ecosystems (social and natural) into a common framework. There is a strong feeling in the Directorate that specialists in natural ecosystems and human settlement patterns have an inadequate knowledge of each other's activities, subject areas and methodologies. The first concrete step in this effort was a MAB-11 Conference entitled "Ecological Approaches to Urban Development Issues" which was held in Miami, FL in the Spring 1982. The Conference was jointly sponsored by the Directorate and the FAU/FIU Joint Center for Environmental and Urban Problems and the University of Pennsylvania. The Conference Proceedings are being prepared and should be published in early Spring 1983. One subsequent activity under consideration is a follow-up conference to be held in 1984.

Second, a group of Directorate members, located primarily at the University of Pennsylvania, is exploring the interactions of the two

ecosystems through the interactions of computer models, as well as other newly emerging formal approaches to system simulation. This activity is still in fairly preliminary stage, but exchanges are taking place with a number of other groups in the United States, Canada, the United Kingdom and other European countries, and Mexico.

Third, the Directorate is sponsoring a number of individual projects. Two such projects are currently active: the Dayton, OH, Urban Forestry Study, in which the City of Dayton is taken as an open laboratory for state-of-the art application of urban forest science; and an Urban Agriculture project, in which Philadelphia is used as a laboratory for developing and testing an inner-city economic development strategy based on intensive urban agriculture. The Dayton Study is supported by the U.S. Forest Service, while the Urban Agriculture Project is a University of Pennsylvania project with negotiations under way to secure financial support from other sources. Discussions are under way with groups at the University of Florida and the University of California to arrange MAB-11 sponsorship of on going projects.

Fourth, the Directorate is committed to maintaining and developing contacts with other Directorates as well as groups in other countries. Ongoing exchanges are being maintained with groups in the United Kingdom, Canada, Mexico and West Germany. Indeed, guests from Mexico and West Germany participated in the May 1982 MAB-11 Conference and presented reports on ongoing work in their home countries.

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ACTIVITIES OF THE U.S. MAN AND THE BIOSPHERE PROJECT 12 (INTERACTIONS OF HUMAN POPULATIONS WITH THE ENVIRONMENT)

Peter Kunstadter, Ph.D., Chairman, US MAB-12
Population Institute, East-West Center, Honolulu, Hawaii 96848

Organization

The US MAB-12 Committee is composed of the following individuals:
Dr. Paul Baker, Pennsylvania State University
Dr. John Bennett, Washington University, St. Louis
Dr. Sidney Goldstein, Brown University
Dr. Peter Kunstadter, East-West Center
Dr. Dwayne Reed, Honolulu Heart and Cancer Study
Dr. Warren Robinson, Pennsylvania State University
Dr. W. J. Schull, University of Texas Medical Center, Houston

General Purposes

The work of this committee is concerned with the interaction of human populations with the environment. In particular, it is concerned with the consequences of population growth, density and movement on the environment, and with the effects of population movements (and the environmental changes associated with movement) on human populations.

Activities

Activities include both those of the committee as a whole, and activities of the individual committee members which are related to the committee's objectives.

Aside from periodic business meetings, most of the substantive work of the US MAB-12 Committee has been funded by outside sources. The primary use of National Committee funds has been for partial support of an international conference held in Honolulu in August 1981, on consequences of migration in Asia and the Pacific. This conference was jointly funded with UNESCO, Paris, and the East-West Center. The symposium brought together scholars from the United States, Australia, Bangladesh, Japan, New Zealand, Pakistan, Thailand, Western Samoa, and the World Health Organization. Implications of populations movements were discussed with regard to the evolution, causes and spread of human diseases, and with respect to socioeconomic, demographic, and environmental changes. Papers from the symposium are being prepared for publication.

Work of individual committee members relating to the objectives of the committee are being funded by a variety of sources. Examples include the following:

Dr. Paul Baker, and his colleagues from The Pennsylvania State University and the University of Hawaii, with funding from National Science Foundation and the National Institutes of Health, have been studying the consequences of environmental change, as related to migration and urbanization for the health of Samoans in Western and American Samoa, Hawaii, and the mainland U.S. Their interdisciplinary study has looked at demographic,

socioeconomic, and health consequences of movement. Their work on hypertension suggests importance of the social and behavioral changes which accompany movement to urban places as causative factors in inducing hypertension in populations characterized by very low blood pressure in their traditional rural settings.

Dr. Sidney Goldstein, in collaboration with colleagues in Malaysia, has been studying the consequences of population movement, particularly rural to urban migration, on human fertility in Malaysia. Although in general migration is associated with reduced fertility, their work points out the importance of the timing of the move, and the tendency for fertility levels to recover over time to approach the level they would have been expected to reach in the absence of migration. This suggests that movement of populations from rural areas (which generally have higher fertility) to urban areas (with lower fertility) will not, by itself result in reduced fertility among the movers.

Dr. Dwayne Reed and his colleagues in the Honolulu Heart Study have been funded primarily by the National Institute of Heart, Lung and Blood. Theirs is a longitudinal study of migrants from Japan to Hawaii and the mainland U.S. The studies in Japan are being conducted in cooperation with the Radiation Effects Research Foundation (formerly the Atomic Bomb Casualty Commission) and the National Institute for Cardiovascular Diseases, Osaka, and in California in collaboration with the School of Public Health, University of California, Berkeley. The focus of these studies is on the role of the changes in environment and behavior (such as diet and work habits) associated with the move from Japan to the U.S. as risk factors in cardiovascular disease and stroke. The current emphasis of their work is on prevention of hypertension through nonpharmaceutical methods.

Dr. Peter Kunstadter, with funding from the National Science Foundation, National Institute of General Medical Sciences, the Ford Foundation and the National Geographic Society is cooperating with scientists from Kasetsart University, Bangkok, Thailand, and University of California, Berkeley, in a long term study of environmental consequences of land use changes associated with population growth and migration in the highlands of northwestern Thailand. This is an area in which forest cover is being removed rapidly both as a result of agricultural practices, and in association with lumbering. Current emphasis of the work is in developing rapid methods of measurement of land use changes by use of ground level observations, aerial photography and earth satellite imagery, and linking these data with data on population movements from census and demographic survey data.

These examples of the current research of our committee members imply several characteristics of the Man and the Biosphere Program. Research is often interdisciplinary, it deals with major problems of human population, health and environmental change, and it often involves long term collaboration between scholars in several U.S. institutions and with scholars overseas. By far the largest share of the funding for the studies comes from sources other than the Man and the Biosphere Program, including both governmental and non-governmetal sources. The U.S. Man and the Biosphere Program has proved to be a valuable catalyst in this process by focusing attention on critical problems, and by bringing together scientists from a wide variety of backgrounds.

U.S. MAN AND THE BIOSPHERE PROGRAM PROJECT 13, PERCEPTION OF ENVIRONMENTAL QUALITY

PRIMARY AREAS OF INTEREST

Perception and management of pests and pesticides: There is growing recognition of the need to view the pest problem and hazards associated with pesticide use within the context of the pest-crop-farmer-market system. MAB 13 and MAB 9, jointly with the International Geographic Union and the United Nations Environmental Program, is sponsoring an international research program in the perception of pests and pesticides.

Perception and management of tourism: International tourism is a growing nomenon frequently associated with high quality environments in both developed and less developed countries. Tourism can serve as a change agent within the social-economic-physical environment involving hosts and visitors from diverse countries. Host-guest interactions and impacts of tourist activities are topics of study in MAB 13.

Land use change in arid and semi-arid environments: Issues of concern in current and future population and land use changes include the multiple value systems involved in the allocation of water resources, loss of agricultural lands and the development of communities for multi-cultural populations. MAB 13 is developing a joint US/Mexico program of research and information exchange on these issues.

Siting of potentially hazardous technological facilities: The siting of certain classes of technological facilities is increasingly perceived as posing hazards to environmental quality and to human safety and well-being. These public perceptions of technological risk to environmental settings and human populations entail generic policy implications at both national and international levels and across a wide range of technologies. This problem addresses broad topics of concern to Project 13: perception of environmental hazards, environmental quality and environmental change.

SELECTED ACCOMPLISHMENTS

Co-sponsorship with MAB-Canada and MAB-Mexico of an international workshop on methods and interpretation of environmental perception research, May 1976.

Co-sponsorship of a 13-country research network in perception and management of pests and pesticides and three research workshops: Campbridge England, May 1979; Worcester, Massachusetts, October 1980; and Nairobi, Kenya, June 1982.

Publication with MAB-Canada and MAE-Mexico of "Perception of Environment" newsletter, distributed to 450 scientists in 60 countries.

Preparation of a state-of-the-art report on the socio-cultural aspects of tourism, 1982.

Drafting of report cooperatively with MAB 8, "Communication to the public in U.S. Biosphere Reserves".

FUTURE PLANS

Research planning workshop with Mexican social scientists on social implications of environmental problems in arid and semi-arid lands, Rio Rico, AZ, March 1983.

International workshop on public perceptions of siting of technological facilities; analysis of cross-national case studies and formulation of cross-cultural research projects, 1983-84.

Formulation of cross-cultural research projects cooperatively with MAB 1, 7 and 8 on the perception and management of tourism, 1983-84.

MAN AND BIOSPHERE PROJECT 14

ENVIRONMENTAL POLLUTION

(MAB 14)

The overall objectives for the national MAB 14 program are designed to agree with the general objectives of the international program which are:

1. To obtain a clearer understanding of relations of pollution to the structure and functioning of terrestrial and associated aquatic ecosystems.
2. To identify physical, chemical and biological measurements and observations which can be used in future monitoring schemes to assess current environmental states and to predict future ecological trends resulting from pollution.

Three general program areas are identified:

1. The analysis of pathways and transformation processes involved in the movement of pollutants through ecosystems.
2. The testing of pollutant-dose response relationships, both in the field and in the laboratory.
3. Identification of environmental indicators which reflect pollution related changes in ecosystems.

The MAB 14 Committee has been inactive since 1976. Recently it was reactivated. The MAB 14 project intends to take an active role in the use of the biosphere reserves for monitoring pollutants; therefore, close interactions with the MAB 8 Committee will be essential. Of particular interest in this area is the proposed three station network of biosphere reserves, one in the U.S., one in the U.S.S.R., and one in Chile, in which ecological monitoring and pollutant monitoring will take place. Other potential projects for the MAB 14 project are the establishment of a background monitoring subset of the National Atmospheric Deposition Program and coordination with similar international activities, and the initiation of an international workshop on the use of human tissues in pollutant monitoring.

SUMMARY OF SELECTED MAJOR
MAB CONFERENCES & SYMPOSIA

MAB-1	Wood Production in the Neotropics via Plantations
MAB-2	IUFRO/MAB Conference: Research on Multiple Use of Forest Resources
MAB-4	Impacts of Limited Water for Agriculture in the Arid West
MAB-7b	Environmental Management and Economic Growth in the Smaller Caribbean Islands
MAB-7b	Workshop to be followed by a Worldwide Conference on Small Islands Development: Opportunities and Constraints
MAB-8	Application of Genetics to the Management of Wild Plant and Animal Populations
MAB-11	Ecological Approaches to Urban Development Issues
MAB-12	Consequences of Migration in Asia and the Pacific
MAB-13	Social Implications of Environmental Problems: A Mexico/United States Research Workshop

WOOD PRODUCTION IN THE NEOTROPICS VIA PLANTATIONS

Executive Summary

An International Symposium on Wood Production in the Neotropics Via Plantations was held at Rio Piedras, Puerto Rico, September 8th through 12th, 1980. The symposium was jointly sponsored by Working Group SI0709 of the International Union of Forest Research Organizations, MAB (UNESCO's Man and the Biosphere Program) U.S. Commission, and the USDA Forest Service. There were 50 participants representing 17 nations involved in preparing, presenting, and attending the session.

The IUFRO working group, Wood Production in the Neotropics Via Plantations, is made up of some 400 members representing about 65 countries. This diverse membership reflects the international interest and concern in meeting needs for wood and wood products in the neotropics without the devasting effects of deforestation. Tropical forests, both public and private, face increasing pressures for food, fiber, shelter and fuel. The symposium afforded an opportunity for exchange of research findings and practical knowledge about some of the hundreds of native and exotic species present in the tropics. Properly matched to site, plantations of fast growing tropical tree species can produce large volumes of wood in short time spans and on relatively small areas. The diversity of the ecosystems within the tropics and the great number of species to be considered add to the complexity of matching species to sites, developing suitable regeneration techniques and identifying efficient management regimes to produce desired products.

Ongoing studies are developing and in some cases refining information on soil and climatic requirements of several promising species. Growth and yield data, knowledge of silvicultural characteristics, and regeneration methodology for these species are also being strengthened through study and experience. Other areas under study include identifying the best seed source to meet local conditions and development of sources of genetically improved seed. Another promising area of research is agroforestry. There are opportunities, particularly in the private sector, for combining agricultural crops and/or livestock production with crops of trees.

The information for matching species to sites, site classifications for growth and yield predictions, optimum intermediate silvicultural practices and regeneration techniques is spotty. The total number of research scientists and professional practitioners in the field of tropical forestry is small in relation to the need for information. Only limited success is possible without a high level of international cooperation and exchange of information. This symposium and the resulting proceedings are part of the continuing effort to coordinate research efforts, share results, and expedite application of the findings.

IUFRO/MAB CONFERENCE: RESEARCH ON MULTIPLE USE OF FOREST RESOURCES

An international conference on research of multiple use of forest resources was held at Flagstaff, Arizona, May 18-23, 1980. This was a joint activity of the International Union of Forestry Research Organizations (IUFRO) and the United Nations Educational, Scientific and Cultural Organizations (UNESCO) Man and the Biosphere (MAB) Program. Over 60 people from 20 countries attended and participated in the conference. A total of 32 papers were presented — 19 invited papers, 11 discussion papers, a keynote address and a banquet presentation. The invited papers covered four subject areas: research techniques for developing multiple-use information, the status and progress of multiple-use research, the application of multiple-use research, and the cost/benefits of practicing multiple-use. Three separate field tours were made during the conference to observe research and multiple-use in action; the tours included the Coconino National Forest, the Beaver Creek Experimental Forest and Biosphere Reserve, the Grand Canyon National Park, the Apache-Sitgreaves National Forest, McNary Container Nursery, Boyce-Thompson Southwestern Arboretum; and other points of interest.

Dr. K. F. S. King, Director General of the International Council for Research and Agroforestry (ICRAF), Nairobi, Kenya provided an eloquent keynote description of multiple-use forestry throughout the world. In some of the developed countries, affluence has led to strong demands for recreation, aesthetics, and preservation of forests; whereas in many developing countries, forest lands are used to sustain the basic necessities of life. Extremism in either case threatens the traditional forestry conservation ethic. Clearly, multiple-use forestry can provide a means to overcome these trends and assure the continued productivity of one of the world's major renewable resources.

Other speakers and discussions indicated that there is a need for research on every forest function -- if the science and art of multiple-use forestry is to progress. Some of the more pertinent research questions that emerged from the Conference were the need to learn how to increase wood production, how to regulate and improve the flow of clear water, how to provide diversity for plants and animals, how to produce agricultural and forest crops on the same land, how to protect the soil and improve the productivity of the ecosystems, how to best provide for recreation and spiritual values, and how to manage for an harmonious balance that maximizes the usefulness of forests for all mankind.

The Conference confirmed that multiple-use science is active and our methodology is improving. Scientists are capitalizing on basic agronomic principles and techniques. They are using modern experimental approaches — including both quantitative and qualitative methods. Computers and systems analyses are commonplace. Yet, scientists also are becoming more humanistic; they are working on programs that directly help people who depend on the land for food, wood, and other uses.

The papers presented at the Conference are printed in English — with abstracts in English, Spanish, and French — in a proceeding published by the U.S. Forest Service. Copies are available at the US MAB office in Washington, D.C.

CONFERENCE ON IMPACTS OF LIMITED WATER FOR AGRICULTURE IN THE ARID WEST

Executive Summary

A national interdisciplinary conference on "Impacts of Limited Water for Agriculture in the Arid West" was held Sept. 28 - Oct. 1, 1982, at Asilomar, California, under the initial leadership of the 12-member Directorate on Arid Zone Ecosystems of the U.S. Man and the Biosphere Program, and in cooperation with the University of California, seven other universities, five federal agencies, and eight private organizations. MAB provided 14% of the funds used to support the conference. Approximately 200 analysts, planners and decision makers representing a broad spectrum of views, interests and professions participated. Thirty-one authors and forty-one discussants presented papers.

Agricultural production in 17 western states depends on irrigation. Population in these states is expected to continue increasing. Various factors apparently will constrain future irrigation water supply: declining ground water levels leading to greater pumping lifts and costs; land subsidence; salt water intrusion into groundwater basins; increased salinization of agricultural lands; increased costs for supplying water and for developing additional supplies; and general reluctance of government and of voters to initiate new water development.

This was the first conference to address in a comprehensive, interdisciplinary manner the anticipated effects of limited water in the arid West on agriculture in order to provide new insights for policy planners. Conference materials include (1) a comprehensive analysis of water resources available for irrigated agriculture in the arid West; (2) the impacts on local, state, regional, national, and international communities of limited irrigation water supplies; (3) recent and proposed changes in policy and practice regarding investment, regulations, conservation and water development; and (4) private and public strategies and tactics for maintaining agricultural viability in the face of water supply constraints.

A number of common views emerged from the conference: (1) there is no immediate national crisis; (2) some regional impacts due to localized decreasing water supplies are inevitable and local effects could be traumatic; (3) impacts of declining water supplies may be partially offset by technical and institutional adjustments, some of which are currently taking place, (4) it is difficult to predict when adverse impacts will become evident because adjustments may still be made; (5) there is much uncertainty because of economic, political, climatic, demographic and other variables; (6) assessment of water supply and demand may change; and (7) lack of a widespread present crisis does not preclude a future crisis caused by increasing population, growing world food and energy needs, and possible climatic changes.

Conferees predicted greater attention to allocation of water supplies by use of market forces, including water transfers; and recognized the decreasing federal role and thus the need for increased local and private sector initiatives.

Materials developed at the conference are being edited and will soon be published in a book for planners, decision makers and the public.

12/17/82

CONFERENCE ON ENVIRONMENTAL MANAGEMENT AND ECONOMIC GROWTH IN THE SMALLER CARIBBEAN ISLANDS

EXECUTIVE SUMMARY

Small island areas, with a restricted natural resource base and a limited absorptive capacity for ecosystem disruption, confront unique problems of environmental management and economic growth as factors in the development process. Their size, relative isolation and restricted options render such areas particularly vulnerable to the pressures and stress factors of internally or externally imposed development projects which affect not only economic growth but also the natural environment, the resource base, and indigenous cultural/social perceptions and response patterns.

Recognizing the "special case" characteristics which influence development activities in small insular areas, the U.S. Man and the Biosphere Program and the United Nations Environment Programme organized a conference in the fall of 1979 on the subject of environmental management and economic growth in small islands.

The specific focus of the conference was the grouping of smaller islands within the Caribbean basin, a developing area characterized by marginal economic growth, fragile tropical ecosystems, and accelerated change patterns which, in recent decades, have placed overwhelming stress on traditional values, indigenous culture, and the extant natural resource base. Contemporary development activity in these islands has too often resulted in strategies which had severe environmental impact, have reduced long-term resource flexibility, and imposed irreversible, undesirable, and unanticipated changes.

Delegates who assembled in Barbados in September of 1979 represented both small island governments in the Caribbean and donor/technical assistance agencies and organizations working in the region. By juxtaposing the two groups, conference organizers provided an opportunity for both to examine how to address the special problems of small islands within the context of broader, more comprehensive development schemes.

Further, the need for environmental management and economic growth strategies, rooted in the West Indian insular experience, was emphasized, and opportunity was provided for island delegates to identify priority resource management programs and areas requiring development assistance. Ten such priority areas were outlined by delegates: pooling regional expertise, workshop and training activities, coastal zone management, soil erosion and reforestation, mariculture, nature reserves and parks, wildlife protection, information retrieval, environmental education, and compilation of socio-economic data relevant to environmental issues.

Delegates also recognized the need for structuring government institutions (when none exist) to improve environmental management strategies within the region, and, further, called for establishment of an environmental management advisory council to be incorporated within an existing regional institution.

The Proceedings of the conference were published in November 1979 as U.S. Department of State publication no. 8996 (International Organization and Conference Series 143).

Workshop followed by a Worldwide Conference on

SMALL ISLANDS DEVELOPMENT: OPPORTUNITIES AND CONTRAINTS

The proposed workshop and conference stems from the work of a group of island experts who met on October 25-27, 1982, at the Department of State in Washington, D.C. The belief of all who participated was that small islands have unique problems in their development and in their structure, which in many instances require for their solutions approaches different than those used on mainlands. The Caribbean Islands Directorate of the U.S. Man and the Biosphere Program organized the meeting.

The experts recommended convening a workshop followed by a worldwide conference. The workshop would bring island experts together to develop the techniques and methodology for analyzing the opportunities and contraints for development in small oceanic islands. Probably lasting ten days, this workshop would be preparatory to a worldwide conference, which would use the techniques developed, and the resource papers, to address the urgent policy questions facing small islands. This would be the "Conference on Small Islands Development: Opportunities and Contraints."

The workshop and conference could be as influential for small islands as was the 1972 United Nations Conference dealing with the problems of developing nations. The experts are encouraged in this belief by the support of UNEP whose Director of its Regional Seas Programme wrote to the Directorate chairman on January 10, 1983, "UNEP would be ready to support and co-sponsor both of these meetings provided the environmental considerations could be appropriately introduced in the meetings' agenda." The proposal has also received promises of support from two UNESCO Divisions: Ecological Sciences, and Human Settlement and Socio-Cultural Environment.

Acting as the precedent for the workshop and conference is the 1979 Barbados meeting, "Environmental Management and Economic Growth of the Smaller Islands in the Caribbean," sponsored by several UN offices, the Caribbean Development Bank, and MAB. This meeting, also conceived and organized by the Caribbean Islands Directorate, set the stage for many of the recommendations UNEP adopted for its environmental program for the Wider Caribbean.

The proposed timetable calls for the workshop to occur in the Spring of 1984, and the conference 12-18 months later.

Caribbean Islands Directorate

EXECUTIVE SUMMARY

Symposium on the Application of Genetics to the Management of Wild Plant and Animal Populations

An international symposium and workshop on the Application of Genetics to the Management of Wild Plant and Animal Populations was held at the Hyatt Regency Hotel in Washington, D.C., August 9-15, 1982. The symposium and workshop was an activity of the MAB-8 Directorate (Biosphere Reserves and the Genetic Material They Contain), co-sponsored by the U.S. National Park Service and 11 other governmental and non-governmental organizations, and endorsed by 18 others. Participants consisted of essentially three groups: 1) leading geneticists, 2) State and Federal resource managers, and 3) State and Federal applied field scientists. The majority of participants were from the U.S., with others from Canada, Europe, Australia and Central America. Nearly all the States including Alaska and Hawaii were represented.

This MAB-8 project was intended to translate and relay the newest developments in genetics to field managers who are in a position to utilize them in their work. One of the most critical problems facing the conservation and management community is the lack of understanding of what is meant by "genetic diversity" or "genetic material." In addition, even less is known of the consequence of establishing a policy to preserve or conserve without a knowledge of the continuously changing characteristics and survival/requirements of species. The symposium and workshop addressed itself to mostly rare or nearly extinct species, covering significant topics such as isolation, extinction, population bottlenecks and founding events, merging of naturally disconnected populations, and factors influencing the taxonomic diversity of species. Unknown to many is that no conservation or restoration program can succeed in the long term (other than by random chance) unless these processes are accounted for and considered in the planning process. Effective policy making depends upon the use of scientific developments/research results such as those presented at the symposium. It was shown that isolation, small population size, inbreeding, the mixing of dissimilar populations and ignoring evolutionary relationships of species can all predispose or lead to extinction. It was made clear that if good use of money and land are to be made in conservation, the manner of making decisions and ranking of priorities will need dramatic change.

Genetics and Conservation (in press) is a book which has emerged from these proceedings and has been written as a comprehensive reference and text. It provides a synthesis of the pertinence of genetics to conservation to protected areas, using national parks for illustration. Edited by Schonewald-Cox, Chambers, MacBryde and Thomas, it will be available on the market in the spring of 1983, published by Addison Wesley Publishing Co., Reading, Massachusetts.

Such a project as this one with a wide scope of applications could not have been effectively sponsored by a single organization or agency. U.S. MAB served as the catalyst and coordinator, pulling together the common interests of these multiple groups, addressed their questions, and provided new avenues of cooperation for State, Federal and private institutions.

1/18/83: CSchonewald-Cox

ECOLOGICAL APPROACHES TO URBAN DEVELOPMENT ISSUES
Conference of the MAB-11 Directorate
Miami, Florida - May 20 - 22, 1982

Summary of Conference Proceedings

The conference was organized out of the need felt by Directorate members to explore the issues, concepts and methods of work arising from the desire to integrate the human and natural ecosystems making up urban ecosystems, into a common framework.

The theme of the conference--Ecological Approaches to Urban Development Issues--underlines the ecosystemic view taken by the Directorate in its definition and perception of urban systems. In this context, ecological approaches--i.e., approaches that focus on the interactions between a system and its environment, a system and its parts, and among its parts--become the elements of a common integrative framework. The Directorate identified three areas as being of particular interest in the process of identifying and probing such approaches: modeling of urban systems and subsystems; planning for urban systems; and environmental impact assessment--which provides a framework within which to analyze and assess the interactions between natural and human subsystems in urban systems.

These three areas provided the themes for three half-day working sessions at the conference. At each session, four separate papers were presented and discussed. A fourth session was held on the last day which was devoted partly to a review of international activities of MAB-11 and partly to a round table discussion on a research agenda for MAB-11. In between, a half day was devoted to a field trip where half of the participants were taken to a visit of part of the Everglades by officials of the South Florida Water Management District followed by a briefing on water management issues in the Region, while the other half visited the Dade County Resources Recovery Plant--the largest such facility in the country--while also being briefed by Agency officials on relevant issues.

In the Modeling session, papers were presented on various approaches to modeling of urban systems. In particular, Dr. Alexander von Hesler from Frankfurt, West Germany, made a detailed and comprehensive presentation of the Sensitivity Model that has been developed by his group and is now being used in several locations in Germany.

Topics covered in the discussions included the various approaches to modeling, the interactions among subsystems of urban systems, the robustness of various modeling approaches, sources of data, the use of energy flows as an integrative instrument in modeling, and modeling philosophies.

The Environmental Impact Assessment session heard presentations on two specific case studies of Environmental Impact--the Seattle Regional Wastewater System and the California Coastal Zones--; a discussion of a novel approach to environmental assessment--the Area-wide Environmental Assessment--developed at the United States Department of Housing and Urban Development; and a review and assessment of the Environmental Impact Assessment process in urban management in the United States. The discussion focused on methods, data, learning

from the experiences and the limitations--both scientific and practical--of the approaches.

In the third session, Planning, a more diverse set of topics was covered. Arq. Luis Sanchez de Carmona, from the Directorate of Human Settlements, Government of Mexico, presented an overview of his department's approach to regional planning in Mexico, and a more in-depth description of the ecological approach used for developing a plan for the Mexico City region. In addition, presentations were made on urban governance--the organizational ecology of urban areas--, the moral/ethical dimensions of planning and policy making, and the management of the relationships between a (urban/regional) system and its environment. Again the discussions focused almost entirely on problems of method and implementation.

In the final session, participants had the opportunity to hear a detailed report on the international activities of MAB-11 from Dr. Brian Spooner. His presentation indicated that the U.S. MAB-11 Directorate could make significant contributions to other MAB-11 programs abroad in several areas, particularly modeling and environmental impact assessment.

The round table discussion that closed the conference selected the following areas for future MAB-11 activities:

- Pursue the development of systematic approaches that are robust, and hence transferable.
- State-of-the-Art in Urban Modeling, emphasizing practice.
- Selection of a single setting or set of settings in which to demonstrate, test and apply new approaches.
- Continue the sponsoring of exemplary projects, such as the Dayton, Ohio, Urban Forestry Project.
- Pursue bi- or multinational projects, particularly with Mexico, Canada and West Germany.
- Border cities (Mexico-United States) may prove a valuable area of bilateral cooperation.
- The Peripheral Canal Project in Southern California might be another setting worth investigating.

CONFERENCE ON CONSEQUENCES OF MIGRATION IN ASIA AND THE PACIFIC
Executive Summary

An international, interdisciplinary conference on consequences of migration in Asia and the Pacific was held at the East-West Center, 25-31 August 1981. This was an activity of the Directorate of Project 12 (Human Population Interactions with the Biosphere) of the U.S. Man and the Biosphere Program, and was supported jointly by the U.S. Man and the Biosphere Program, the Population, Resource Systems and Environment and Policy institutes of the East-West Center, and the Man and the Biosphere Programme of UNESCO (Paris). Participants, representing anthropology, demography, ecology, economics, genetics, geography, humanities, medicine, parasitology, political science, and sociology prepared and presented some 32 papers dealing with biomedical, demographic, socioeconomic, and environmental consequences of migration, and their implications for public policy. In addition to 23 participants from the United States, participants came from American Samoa, Australia, Bangladesh, Japan, New Zealand, Pakistan, Philippines, Switzerland (World Health Organization), Thailand, and Western Samoa. Total attendance at the conference was about 60.

Migration was shown to be an important factor in the evolution, spread and possibilities for control of infectious and parasitic diseases (especially malaria, smallpox and filariasis). Studies of migrating groups were also shown to lead to better understanding of chronic and degenerative disease processes, including cancer, diabetes, hypertension, and diseases linked to genetics. Such studies are an especially useful tool in distinguishing between genetic and environmental factors in these diseases. Demographic studies showed that migration is an important factor in redistributing populations within and between countries, and that it also is significantly related to fertility differentials within countries. Fertility of migrants tends to be intermediate between that of the population at place of origin and that of the population at destination. Studies of the social and economic consequences of migration showed that adaptation to the new environment was related both to the characteristics of the migrants themselves, and to the society into which they moved, with significant differences in adaptation among different ethnic groups. Environmental consequences of migration depend on the nature of the environments between which people move, the rates and numbers in which they move, and the types of land use they practice. Rural depopulation as a result of rural to urban migration was shown to have as serious environmental consequences in some cases as the consequences of migration into rural and urban areas.

Migration policies and migration-related policies (e.g., the provision of social services for migrants) were shown to be among the most sensitive and difficult policies to design and enforce, because they impinge on so many values basic to the societies in which they are enacted. Although planning may anticipate and alleviate some of the environmental, social, demographic and health problems associated with migration, both internal and international migration are very difficult to control.

Papers from the conference are being edited for publication.

SOCIAL IMPLICATIONS OF ENVIRONMENTAL PROBLEMS:
A Mexico/United States Research Workshop

BACKGROUND

The Northern region of Mexico and the Southwestern region of the United States share a number of common characteristics. Both are predominantly arid or semi-arid regions with limited water resources, both have significant irrigated agricultural lands and both are subject to major land use change as a result of population growth. These regions are presently experiencing urbanization and land use changes at heretofore unimagined rates. Furthermore, it is predicted that these increases and rates of change will accelerate in the future. The regions within the two countries are inextricably linked by common physical environments and some shared cultural patterns as well as by trans-border movement in both directions.

PURPOSE

This workshop is organized for purposes of exploring opportunities for communication and cooperative research on behavior and environment issues attendant to the kind of growth and change currently being experienced and predicted to continue into the future. Two categories of issues are particularly appropriate for consideration. These are: (1) behavioral implications of urban and rural growth, and (2) perceptions of urban environment-natural environment interactions. The first category includes: the causes of growth, expectations of in-migrants, changing land use patterns and related problems of environmental design and planning. The second category includes: the perceived values of natural environments within cities and outside, perceptions of agriculturalists, urban residents and tourists and perceived range of strategies for accommodating growth and change.

OBJECTIVES

The objectives of the workshop are to: (1) foster interaction of Mexican and American social scientists on research issues for which there is shared interest; (2) develop a list of research issues, within the two broad categories, towards the solution of which behavioral and social scientists can make significant contributions; and (3) to produce a written summary of the workshop discussions for dissemination to appropriate agencies, institutions and individuals.

DATE AND LOCATION

The workshop is scheduled for March 9-11, 1983 at Rio Rico, Arizona; just north of Nogales, Sonora-Arizona.

CO-CHAIRS

Dr. Carlos Pena, Director, Food and Development Research Center, Hermosillo, Sonora
Dr. Ervin Zube, Director, School of Renewable Natural Resources, University of Arizona, Tucson

Food and Development Research Center, Hermosillo, Sonora
Committee on Environment and Behavior, University of Arizona
U.S. Man and the Biosphere Program

Dr. CLARK. This conference supported the broad objectives of the administration's Caribbean Basin Initiative.

Another example of this directorate's good works is a MAB contract with the U.S. Peace Corps to prepare a manual on the techniques of reforestation in New World tropics. Our goal is to put together in a useful manual information that is now scattered and unavailable to Peace Corps volunteers in Latin America.

Here a small investment in a manual may pay off through extensive tree plantings on currently degraded lands.

In summary, the MAB tropical forests directorate is a small group of people trying very hard to combine their talents with available financial and scientific resources for the promotion of one idea: that humans and the tropical forests can coexist productively through better knowledge of the immense variety of opportunities that these forests offer.

Thank you.

[The prepared statement of Mr. Clark follows:]

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STATEMENT OF
F. BRYAN CLARK, ASSOCIATE DEPUTY CHIEF,
FOREST SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

Before the
Subcommittee on Natural Resources,
Agricultural Research and Environment,
Committee on Science and Technology
United States House of Representatives

Concerning the Man and Biosphere Program

April 5, 1983

MR. CHAIRMAN AND MEMBERS OF THE SUBCOMMITTEE:

Thank you for the opportunity to appear here today to participate in your examination of the Man and Biosphere program. I would like briefly to explain the Forest Service's involvement in the program and then address our participation in two of the program's directorates.

The Forest Service has been a participant in the Man and the Biosphere Program (MAB) since the program was organized in the United States in 1971. Within MAB we have been active primarily in research on temperate forest and tropical forest ecosystems and in the establishment of biosphere reserves. These are three areas where our mission complements the objectives of MAB, and where our participation in MAB has helped us achieve mission objectives in research, international forestry leadership, and conservation and management of natural resources. We have also been active within MAB in research on grazing lands and mountain and arctic ecosystems.

Our participation in MAB has taken several forms. Many of our research scientists have participated directly in MAB field research projects, either as team leaders or as members of interdisciplinary research teams, and often in cooperation with research scientists from universities or from other government agencies. Forest

Service scientists have also served as members or leaders of MAB subject-area groups, known as directorates, to plan, encourage, and carry out research programs. Currently 10 of our research staff serve on MAB directorates, including the leader of the tropical forests directorates, Dr. Ariel E. Lugo, and the co-chairman of the directorate on biosphere reserves, Dr. Stanley L. Krugman. Since MAB was organized, the Forest Service has assigned members of its research staff on a full-time or part-time basis to assist the MAP Secretariat in the State Department. This assignment has helped provide continuity as well as overall coordination of the MAB program. In similar manner, the Forest Service provided a member of its research staff for a total of three and a half years to assist the MAB Secretariat in UNESCO in administering the program worldwide.

The Forest Service has provided members of delegations to international conferences sponsored by MAB, and members of research teams for MAB projects in other countries. For example, we helped to organize the US-USSR agreement on monitoring in MAB biosphere reserves and we have worked with Mexican scientists in a program of joint research between La Michilia Biosphere Reserve in Mexico and our Beaver Creek Experimental Watershed and Biosphere Reserve in Arizona. Our membership in MAB has aided our cooperation with other agencies and institutions in the U.S. For example, we helped to establish the Consortium for the Study of Man's Relationship with the Global Environment in 1979. Since then, we have participated with the National Park Service and other agencies in funding research through this Consortium on areas of mutual interest. Most of this research is carried out by universities, often in close cooperation with our own scientists. All of these activities have been of direct benefit to the accomplishment of our mission, and we remain enthusiastic participants in MAB.

Two areas of MAB are of particular interest to us. They are: (1) the use of biosphere reserves for conservation of forest genetic resources, and (2) activities being coordinated by the U.S. MAB directorate on tropical forests.

Biosphere Reserves and the Conservation of Forest Genetic Resources:

One of the more active project areas in the Man and Biosphere (MAB) program in the United States, and in many other countries, is project 8, Conservation of Natural Areas and of the Genetic Material They Contain, more commonly referred to as the biosphere reserve program.

The objectives of MAB-8 are threefold: (1) to conserve for future use the diversity and integrity of plants and animals in their natural environment and to safeguard the genetic diversity upon which their continuing evolution depends, (2) to provide for ecological and environmental research, including baseline studies, within and adjacent to biosphere reserves, and (3) to provide facilities for education and training.

Traditional methods for the conservation of forest genetic resources have not been completely successful or effective. However, MAB's biosphere reserve system meets at least some of the needs of forestry. Biosphere reserves provide a unique opportunity for conserving large areas and thus, for certain forest types, a method for maintaining unusual as well as conventional forest ecosystems. Such forested areas, if properly selected and managed, provide a genetic reserve.

The maintenance of genetic diversity is fully as important for modern forestry as it is for general agriculture. An active and vigorous program for the protection and conservation of basic agricultural crops and their progenitors is essential if modern agriculture is to meet world food needs. Such efforts continually receive serious attention by the agricultural community, and they are generally accepted by the public.

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The need for similar efforts to conserve the forest genetic heritage are less well understood by both the public and the forestry community. Yet, appropriate management of the genetic resource is essential if forestry is to meet the unforeseen biological, social, and economic needs of the future.

Forestry has learned from the unfortunate experiences of agriculture wherein some of the original genetic base was lost. Therefore, forestry is attempting to maintain a reliable and highly varied genetic reservoir for future use and possible genetic improvement. Fortunately, there are still sizeable areas of undisturbed gene resources in our native forests that can be utilized.

A comprehensive program for identifying and maintaining ancestral forest tree lines and a broad genetic base both for current and future tree improvement programs are needed. Maintaining an adequate diversity of the forest genetic resource provides an opportunity to respond to natural catastrophes by restoring forest stands. This same genetic diversity also is needed for developing new combinations to produce individuals that are better adapted to specific environmental situations and thus make it possible for a reduced land base to support a more productive forest under intensive forest management. By providing for the conservation of the genetic resource, the biosphere reserves contribute to achieving this goal.

Forest resources are not limitless, and they are being subjected to numerous pressures. Utilization of forest resources is increasing, and so is conversion of forest land to agriculture and urbanization. To researchers and foresters interested in the maintenance and the long-term genetic improvement of forest crops, biosphere reserves offer a new opportunity to advance the science of forest tree improvement by insuring a breeding population and a much needed

safeguard for maintaining genetic diversity of forest trees subjected to intensive forest management.

Forestry uses of the biosphere reserves are not in conflict with the general philosophy of the system. To the contrary, the biosphere reserve effort is strengthened if the system can meet these forestry challenges in gene pool management.

Activities of the U.S. MAB Tropical Forests Directorate:

The tropics occupy about 48 million km^2, of which approximately 45 percent are covered with forests. These range from broadleaf forests on waterlogged soils receiving over 300 inches of rain a year to cactus forests receiving only 20 inches of rain a year. These forests are the source of many beneficial goods and services. Since the 1960's, the proportion of the world's round wood production contributed by the tropics has increased from about 25 percent to over 40 percent today. Eighty percent of this production satisfies energy needs, as fuelwood and charcoal, for millions of people living in the tropics; the rest supplies world markets for fine tropical woods. Tropical forests also supply protein, water, recreational activities, and other amenities for the people of the tropics. In the United States, our Caribbean National Forest attracts well over a million recreation visitors a year and provides clean water for much of the population of Puerto Rico. In addition, a significant fraction of our existing pharmaceuticals are derived from tropical species. The incredible richness of plant and animal species in the tropics promises still further useful drugs and other chemicals yet to be discovered.

Because every year about 7.5 million hectares of tropical forests are lost, and because tropical forests support some of the richest and still undisturbed

assemblages of plant and animal species in the planet, there is worldwide concern for the future of this valuable global resource. The U.S. MAB program through its directorate on tropical forests concerns itself with the complex task of trying to understand how tropical forests work, how they can best be managed to serve human needs, and ways of balancing human aspirations with the natural limitations of tropical forest ecosystems.

The US MAB-1 directorate is small (9 U.S. scientists). It meets once a year to set priorities for three types of activities: sponsorship of research, sponsorship of workshops, and preparation of review papers.

The principal research objective of the MAB-1 directorate is to foster an understanding of the roles of people in tropical forest ecosystems.

Examples of topics include:

- the ecology of dry tropical forests, related fuelwood shortages, and associated site degradation;
- techniques for restoration of productive capacities of devastated sites caused by overgrazing, fire, destructive logging, or other misuses of land;
- ecological and social implications of the conversion of forests to pastures;
- economic and environmental costs and benefits of tree plantations.

About 20 MAB studies in tropical forests have been funded over the past 7 years with a total cost of $870,000. For example, on the border between the Brazilian Amazon forest and the dry, impoverished northeast, scientists from the University of Florida studied the relationship between the palm known as Babassu (Orbygania) and the population of the region, which numbers in the hundreds of thousands. This palm was considered a weed by local owners. Through a study of the palm's ecology and its multiple uses by local people, techniques for its management and care were developed. Private enterprise then

developed a small scale technology for better use of the palm. Some 20 uses were identified, from cooking oil to fuelwood, all from this one plant species. This MAB study helped change social attitudes, developed new technology, and contributed to better use of a local resource.

Another approach is to develop natural resource management techniques for application over broad regions. As an example, a study in the Luquillo Experimental Forest and Biosphere Reserve in Puerto Rico aims at ways of managing natural forests for timber products, wood for novelties, and watershed protection. In another study in the same area, comparisons are made between the natural forest and plantations established under similar conditions. Both of these MAB studies allow for the culmination of experiments started 20-30 years ago but abandoned because of lack of funds at the local level.

The directorate has also sponsored a number of conferences and workshops, including one last year of Caribbean foresters in Saint Lucia. With a total investment of only $9,000, we were able to gather 50 foresters from 10 islands and 5 countries for a week of discussions. As a result a Caribbean Forester Society was organized and is supported by the International Society of Tropical Foresters; six priority activities for forestry in the Caribbean were identified and endorsed; position papers on the state of the forestry on each of the islands were presented; and a proceedings volume was published (a copy of which is submitted with this statement). This conference supported the broad objectives of the Administration's Caribbean Basin Initiative.

A symposium on wood production in forest plantations in the new-world tropics was held in Puerto Rico through cooperation of MAB, the Forest Service, and the International Union of Forestry Research Organizations. Although forest plantations

account for less than one percent of the total tropical forest area, one hectare of well managed plantation can produce as much as 10 times more wood than can the same area of mature natural forest growing in the same environment. One reason for the small area dedicated to plantations is the high cost of their establishment and maintenance, but equally important is a lack of knowledge of which tree species to plant and the best silvicultural treatments to apply in a given tropical environment. By expanding our understanding of wood production in plantations, the pressure on natural tropical forests for timber products can be reduced, and the world can be better assured of a continued source of tropical woods to meet increasing demands. In turn, reduced pressure on natural forests for timber allows their conservation and use for other human needs such as food or habitat. This symposium, too, required only modest support from MAB (less than $10,000), but it produced significant reports on techniques of plantation establishment, expected yields, and management alternatives for the neotropics.

The tropical forests directorate also has begun to compile existing information relevant to management of tropical forests to meet human needs. For example, a global survey of mangrove areas assessed the condition of this important tropical type. Mangroves provide firewood and other products for millions of tropical people, and they support most commercially important fisheries, including many of our own on the Gulf and Atlantic coasts. Because of coastal development, mining, and inland stream control, mangroves around the world are under severe pressure.

Equally important is MAB's contract with the U.S. Peace Corps to prepare a manual on the techniques of reforestation in the new-world tropics. Our goal is to put together in a useful manual, information that is now scattered and unavailable to Peace Corps volunteers in Latin America. Here, a small investment in a manual may pay off through extensive tree plantings on currently degraded lands.

In summary, the MAB tropical forests directorate is a small group of people trying very hard to combine their talents with available financial and scientific resources for the promotion of one idea: that humans and the tropical forest can coexist productively through better knowledge of the immense variety of opportunities that these forests offer.

That concludes my prepared statement. I and my colleagues would be happy to respond to the Subcommittee's questions.

Mr. MACKAY. Thank you, Dr. Clark.

Dr. Gregg.

Mr. GREGG. Thank you, Mr. Chairman. Like my colleagues, I am pleased and honored to be here. I have been associated with MAB for a number of years, and hopefully this will be a watershed in terms of increasing the effectiveness of this program.

Mr. MACKAY. I think we are all beginning to realize that things start with small beginnings.

Mr. GREGG. We have been, certainly, very well accustomed to the smallness of the program, and we would hope that we can look forward to the opposite.

The biosphere reserve project of MAB is, certainly, I think, the best known in the United States. It is the largest of the project directorates in the United States, has the broadest degree of both governmental and nongovernmental institutional participation.

The project, the MAB project with which we are associated, actually has a broader focus than simply the management of biosphere reserves, the designation of management of biosphere reserves.

Rather, it is concerned with the conservation of protected areas generally, as well as the genetic resources they contained. Dr. Clark has mentioned some of the aspects of the programs in biosphere reserves, and outside, which relates to the protection of genetic resources.

I might point out this has been a major concern of ours and we are actively involved in programs to provide additional perspective on the management of genetic resources, having held a large workshop here in Washington last year to look at the applications of genetics in the management of wild plant and animal populations.

This brought together managers and scientists in an extremely, I think, exciting, interactive forum to explore the possibilities for managing genetic resources in a world vastly different from the one in which plant and animal species in natural protected areas evolved.

We are very concerned about this in biosphere reserves. It is one of our main emphases. I think that it is worth pointing out, though, in the broader context, that biosphere reserves represent, I think, a new dimension in global conservation.

For the first time, we are setting aside areas around the world according to a unique, uniform set of criteria to conserve a representative sample of the world's ecosystems and the genetic resources they contain, as well as to develop better ways to manage them to support the progressive advancement of human civilization.

Biosphere reserves are multiple use areas. They are multiple function areas. They are internationally recognized for their value in conservation, as global benchmarks, guideposts of environmental quality and as major centers for developing management systems which are well suited to the environmental, ecological, cultural, economic and social conditions of the countries in which they occur.

This distinguishes them, I think, from any other form of conservation area which typically may perform some of these functions, but by no means all of them. Well, within the reserves are places where wilderness is given very strict protection to provide baseline

information needed to understand how ecosystems are structured and how they function.

At the same time, they also contain places where controlled experimentation helps provide the scientific basis for sustainable production of the materials and amenities required to maintain and enhance the quality of life.

I think, finally, they contain places where demonstration and training projects transfer the knowledge and skills gained from scientific studies to local populations and special groups, who in benefitting tangibly from the programs in the biosphere reserves will become the ardent supporters of conservation.

Finally, I think that it is important to recognize that biosphere reserves, particularly in the United States, are increasingly important centers for communicating information about the interrelationships between human beings and their environment on a local, regional, national, and international scale.

They are also becoming centers for domestic and international scientific cooperation, as well as the regional centers for testing land management methods and providing extension services and conservation education to local populations. In many countries this becomes a particularly important function in building a conservation ethic within these countries.

Well, I think also by designating biosphere reserves, we are underscoring the educational and scientific values of an area, and this will certainly over time increase the interest of the scientific community in turning out studies within those areas as protected areas for ecological research, both basic and applied become progressively less available.

They have become increasingly, because of their multiple functions, places where natural and social scientists, diverse disciplines, work together to developed balanced perspectives on managing large landscape units.

I think this is one of the unique focuses of a large portion of the MAB program, namely, that it deals in large landscape units, regional ecosystems, if you will, which are relevant to the scale of human activity.

Well, in the United States, the history of the biosphere reserve program and its use has been one of progressive evolution. In the early days simply to get the program established on an international scale, biosphere reserves, the designation was simply applied as an overlay to preexisting administrative designations.

This established a large number of biosphere reserves in the United States and other countries, but it did not necessarily in the early days redirect in any way the functions of those areas, or improve cooperation among them.

In recent years we have changed the concept a bit to use the biosphere reserve as a force for regional cooperation, international cooperation. I will talk to this in a moment.

Although biosphere reserves have no separate legal status, the Government agencies and other organizations which administer them usually invariably have adequate legal authority and management capability to insure long-term protection. The management of a biosphere reserve is the sole prerogative of the administrator. This, I think, at first glance might seem to be a problem, I

think that it is important to recognize that the designation carries with it an obligation to securely protect the site and use it effectively for scientific and educational purposes. In actual fact, the administrators of biosphere reserves up to this point have honestly and sincerely honored this obligation.

In the United States, we currently have 38 biosphere reserves. It is the largest network in the world. It contains many of the Nation's outstanding protected areas, such as Everglades National Park in Florida, Yellowstone, and Sequoia National Parks, which are preeminant baseline ecological monitoring areas, as well as sites for experimental research, such as the Hubbard Brook Experimental Forest, N.H., the Luquillo Forest in Puerto Rico, and the Central Plains Experimental Range in Colorado.

I think that it is fair to say that the collective capability of the network in both basic and applied ecosystem science and natural resources management is unequaled anywhere in the world. The designation recognizes these capabilities and challenges the administrators of these sites to put them to work for human benefit.

A biosphere reserve should protect a representative sample of the ecosystems which characterize one of the world's major biogeographic regions. It should also provide large areas for baseline study and experimental work in as many of these systems as possible.

In each of the regions of the United States we have looked at so far, it has been impossible to find one site which has all of the representative ecosystems represented within it and provides opportunities for all kinds of research. For this reason, we thought it necessary to designate multiple sites in each region and each site has traditionally borne the name of the administrative unit, such as the national park.

Now, I want to get to the question of the departure from this traditional approach. I think it is one of the more exciting dimensions of MAB and the biosphere reserve program.

In northern California, we are trying out a new approach, whereby multiple sites under different administrators will be drawn together under the aegis of a single biosphere reserve, which will bear the name of the biogeographic region.

We will call it the California Coast Ranges Biosphere Reserve and it includes the general biogeographic region running from the Oregon border to the vicinity of Santa Cruz, south of San Francisco.

We expect that this biosphere reserve will eventually contain sites in three or four different geographic areas containing representative ecosystems characteristic of the region, providing a diverse opportunity for both baseline and observational research, and containing sites represented by as many as half a dozen different administrators.

Once the sites have been symbolically associated within the framework of the biosphere reserve, we will make concerted efforts to develop vehicles to encourage cooperation among them and ultimately institutions which permit this cooperation to take place on a regular basis.

I think these linkages in the developed countries, particularly, hold a unique promise for promoting conservation among people

who have reason to be most concerned with the intelligent use of the natural resources of particular regions.

Finally, I think that it is worth mentioning that biosphere reserves are involved in cooperative activities with many other countries on problems of common interest. U.S. biosphere reserves are participating in ecological and pollution monitoring work with the Soviet Union and Dr. Wiersma will talk to that project in some detail in a few moments.

We are also looking at the basis for managing desert watersheds and sustaining the populations of wildlife in cooperation with Mexico involving biosphere reserves. We have biosphere reserve selection studies being carried on jointly with Canada, in British Columbia, in adjacent Alaska, as well as along the U.S./Canadian border elsewhere.

We are also planning this year a major workshop and training program involving countries from Europe, and South Africa, as well as the United States, in the management of large wetland ecosystems, and that will take place in Everglades National Park later this year. We have a delegation of U.S. scientists visiting large wetland biosphere reserves right now in these places.

Next, of some particular interest in view of the Caribbean Basin Initiative, we are planning next month a workshop in the Virgin Islands to look at the possible use of biosphere reserves and other protected areas to support sustainable development of small Caribbean Islands.

Incidentally, as part of this, and I think in part because of the fact that the Virgin Islands National Park is a biosphere reserves, we in the National Park Service are planning to establish a major research facility in the Virgin Islands which should provide both facilities and logistical support within the Virgin Islands for cooperative projects involving the entire Caribbean region.

I think the professional relationships established between United States and foreign scientists and managers working together in biosphere reserves can significantly improve the standard of land management through technology transfer and joint projects. In addition, the use of biosphere reserves for demonstration projects can improve the continuity and cost effectiveness of foreign assistance for world development.

Improved coordination of research activities remains a major goal of the 215 unit global network as it continues to expand to include more nations and greater representation of the world's ecological diversity.

I think it is obvious that since 1976 when UNESCO designated the first biosphere reserves, the project has grown to become a major force in global conservation. It has complemented other natural area conservation efforts by giving certain protected areas a new mission in providing the scientific basis for sustainable conservation of the world's ecosystems.

It has helped make conservation of protected areas relevant to the needs and aspirations of large numbers of people and is playing an important role in building a conservation ethic in many countries. Its potential deserves to be explored and further developed, and I certainly look forward in any way I can to provide you with whatever information you may wish to assist in that objective.

[The prepared statement of Mr. Gregg follows:]

Statement of
William P. Gregg, Jr.
Ecologist, National Park Service
Co-chairman, U.S.- MAB Project Directorate on Biosphere Reserves
Before the Subcommittee on Natural Resources,
Agriculture Research and Environment
Committee on Science and Technology,
House of Representatives
April 5, 1983

The world network of biosphere reserves represents a new dimension in global conservation. For the first time, areas are being set aside around the world according to a uniform set of criteria in order to conserve a representative sample of the planet's ecosystems and genetic resources, and to develop better ways to manage them to support an ever advancing human civilization.

Biosphere reserves are unique multiple-function areas, internationally recognized for their value as conservation areas, as global benchmarks of the planet's ecological health, and as centers for developing management systems particularly suited to the ecological, cultural, and economic conditions of particular regions.

Within these reserves are places where primitive wilderness is given the strictest protection to provide the baseline scientific information we need to understand how ecosystems are structured, how they operate, and how they are changing in response to natural and human influences. At the same time, they contain places where controlled experiments help provide the scientific basis for sustainable production of the materials and amenities required to maintain and enhance the quality of human life. Finally, they contain places where demonstration and training projects transfer the knowledge and skills gained from scientific study to local populations and special groups who, in reaping the tangible benefits of ecosystem conservation, become its ardent supporters.

2

Increasingly, biosphere reserves are becoming centers for domestic and international scientific cooperation as well as regional centers for testing land management methods and providing extension services and conservation education to local populations.

By underscoring the educational and scientific value of an area, biosphere reserve designation often increases the scientific community's interest in utilizing the area for research and demonstration. As research use and the body of scientific information on the sites have grown, and as the availability of protected sites for ecosystem research elsewhere has declined, biosphere reserves have increasingly become centers where natural and social scientists in many fields work together to develop the balanced perspectives needed for informed management of large landscape units.

In the United States biosphere reserve designation has been applied primarily to existing protected areas large enough to include an entire ecosystem unit, such as a major watershed, and administered as a national park, wildlife sanctuary, or in a similar protected status. Although biosphere reserves have no independent legal status, the government agencies, universities, and private organizations which administer them invariably have adequate legal authority and management capability to ensure protection. Management of a designated area is the sole prerogative of the administrator. While this may appear a problem at first glance, it is important to recognize that designation carries with it an obligation to securely protect the site and use it effectively for scientific and educational purposes. In fact, administrators do honor this obligation.

The 38-unit domestic biosphere reserve network contains many of the nation's outstanding protected ecosystems--such as Yellowstone, Sequoia, and Everglades National Parks - as well as preeminent sites for experimental ecological research--such as the Hubbard Brook Experimental Forest (NH), the Luquillo Experimental Forest (PR), and the Central Plains Experimental Range (CO). The collective capability of the network in basic and applied ecosystem science and natural resource management is unequaled anywhere in the world. Biosphere reserve designation provides recognition of these capabilities and challenges administrators to put them to work for human benefit.

3

A biosphere reserve should protect a representative sample of the ecosystems characteristic of one the world's major biogeographic regions, as delineated generally in a classification system developed by UNESCO in 1975. It should also provide large areas for baseline study. and for experimental research in as many of these ecosystems as possible. In each of the regions of the U.S. studied to date, it has been impossible to find a single site which contains all of the representative ecosystems and provides opportunities for both kinds of research. For t is reason, it has been necessary to designate multiple sites in each region, and each site has traditionally borne the name of an administrative unit, such as a national park. In northern California, a new approach is being initiated whereby multiple sites under different administrators will be joined together to form a single biosphere reserve bearing the name of the biogeographic region. In this case, it will be called the California Coast Ranges Biosphere Reserve and is expected eventually to contain sites under seven different administrators. Once the sites are symbolically associated within the framework of the biosphere reserve, efforts will be made to encourage voluntary scientific cooperation among the participating agencies and institutions.

The linkage of complementary land management units under the banner of a single designation is a unique capability of the biosphere reserve concept, and one which holds great promise for fostering cooperation among those most concerned with the conservation and intelligent use of the natural resources of a particular region.

Finally, many biosphere reserves are involved in cooperative projects with other countries on problems of common interest. For example, U.S. biosphere reserves are participating in pollution monitoring studies with the Soviet Union, desert watershed and wildlife management projects with Mexico, joint biosphere reserve selection studies with Canada, work on the management problems of large wetland reserves with several European and African countries, and an international workshop is scheduled next month at the Virgin Islands National Park Biosphere Reserve to assess possibilities for use of biosphere reserves to support the integrated development of the small islands of the Caribbean Basin. The professional relationships established between U.S. and foreign scientists and managers working in

biosphere reserves can significantly improve the standard of land management through technology transfer and joint projects. In addition, judicious use of biosphere reserves for demonstration projects can improve the continuity and cost effectiveness of U.S. foreign assistance for rural development. Improved coordination of research activities remains a major goal as the 215-unit global network continues to expand to include more nations and greater representation of the world's ecological diversity.

Since 1976 when the first biosphere reserves were officially designated by UNESCO, MAB's biosphere reserves project has grown to become a major force in global conservation. It has complemented other natural area conservation efforts by giving certain protected areas a new mission in providing the scientific basis for sustainable conservation of the world's ecosystems. It has helped make conservation of protected areas relevant to the needs and aspirations of large numbers of people, and is playing an important role in building a conservation ethic in many countries. Its potential deserves to be explored and developed.

PROFESSIONAL RESUME - WILLIAM P. GREGG, JR.

Dr. William P. Gregg, Jr. holds a B.A. in biology from the University of Pennsylvania (1965), an M.S. in botany from Rutgers University (1967), and a Ph.D. in ecology from Duke University (1971), where his dissertation focused on causes of ecological succession in plant communities in the eastern deciduous forest biome. After joining the National Park Service in 1971, Dr. Gregg served as an ecological consultant in planning for development, resource management and public use in units of the United States National Park Service.

He was responsible for establishing and managing a multi-disciplinary team of scientists in the Bureau's central planning office in Denver, Colorado, and for assessing the impacts of its plans and programs. From 1974 to the present, Dr. Gregg has served at the Bureau's headquarters in Washington, DC, first as an environmental impact analyst, then as the official responsibile for compliance with environmental legislation and executive requirements. Since 1980, he has served as Coordinator of National Park Service participation in the Man and the Biosphere Program as well as Co-chairman of the US-MAB Project Directorate on Biosphere Reserves.

His present responsibilities focus on domestic and bilateral development of science and resource management programs involving U.S. biosphere reserves and on the expeditious completion of the United States network of biosphere reserves, now containing 38 units. During the past several years, he has been closely associated with Federal initiatives to limit development and enhance conservation of the nation's coastal resources.

INTERNATIONAL CONFERENCE-EXHIBIT

ECOLOGY IN PRACTICE

Establishing a scientific basis for land management

Paris, 22-29 September 1981

Abridged

THE BIOSPHERE RESERVE PROJECT: THE UNITED STATES EXPERIENCE

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ABSTRACT

The Biosphere Reserve Project is the largest and best known of the 12 MAB Projects presently active in the United States. The nation's Biosphere Reserve System counts 36 units, representing 16 biogeographic provinces and 5 coastal regions. The Project's administrative structure and the selection procedures for U.S. Biosphere Reserves are discussed. The status of monitoring, research, demonstration, training, and public communication is evaluated, and opportunities for improving the impact of the Project in addressing regionally and globally significant ecosystem management problems are explored. The need for integration of ecosystem research and related activities within biotic regions and the development of bilateral pilot projects is emphasized.

KEYWORDS

Biosphere Reserve, Man and the Biosphere Programme (MAB), United States ecosystem research, environmental education.

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THE BIOSPHERE RESERVE PROJECT: THE UNITED STATES EXPERIENCE

Following the UNESCO-sponsored "Biosphere Conference" of September 1968 at which the MAB Program was conceptually launched, and the UNESCO General Conference of November 1980 at which it was programmatically established, United States scientists were continually involved in the planning and development of MAB in general, and MAB Project 8 in particular. After MAB's newly established International Coordinating Council recommended the establishment of the Biosphere Reserves Network as one of MAB's project areas, these scientists helped generate significant support in the United States, both within the scientific community and in government. As a result, the United States was able to endorse enthusiastically the recommendation of the United Nations Conference on the Human Environment (Stockholm, June 1972) to establish a "world-wide network of protected areas to preserve representative examples of the world's ecosystems."

Following the Stockholm Conference, the United States participated in important international efforts in 1973 and 1974 which provided the framework for selecting, designating, and managing biosphere reserves (UNESCO 1973, IUCN 1974, Udvardy 1975). However, faced with the failure to obtain funds from international organizations to develop the network, project proponents realized that its survival might well depend on the ability of the developed countries to take the lead in providing the initial financial and moral support needed to get the project underway. The matter was fortunately scheduled as an agenda item at the Moscow

summit conference between Presidents Brezhnev and Nixon in July, 1974. In the official communique, both nations agreed to designate biosphere reserves and utilize them for conducting scientific investigations leading to more effective protection of the global environment. In the United States, this Environmental Agreement immediately provided a catalyst for translating general support into actual establishment of biosphere reserve sites.

Following the summit conference, there was considerable enthusiasm in the U.S. for establishing the first biosphere reserves at the third annual ICC meeting in September, 1974. Given the severe time constraint, US-MAB emphasized selecting outstanding, securely protected ecosystems representative of the nation's bio-geographic provinces which illustrated either a substantial history of monitoring and ecological research or exceptional potential for such activities. It was recognized that, under UNESCO guidelines, the ideal biosphere reserve should contain a large, strictly protected core zone for ecosystem conservation and long-term baseline ecological study, associated with a peripheral buffer zone to provide additional protection to the core as well as opportunities for experimental research. Unfortunately, it became apparent that few such ideal sites were available, owing largely to substantial differences in the management policies of Federal agencies administering candidate sites. Large conservation areas, eminently suitable as core zones, were primarily administered by the National Park Service. The candidates included some of the nation's finest National Parks --such as Glacier, Great Smoky Mountains, and Yellowstone. The agency's policies permitted experimental manipulations only in limited cases, where deemed essential to restore natural conditions and processes. In addition, the history of ecological study in many of these areas was limited. On the other hand, many areas with long histories of significant forest and range management research were administered by the Forest Service and the Agricultural Research Service (both within

the Department of Agriculture). Most were relatively small sites within large tracts managed for sustained timber or livestock production. Although the experimental sites normally included small undisturbed natural areas, which served as controls, none contained the large undisturbed areas suitable for conservation of large-scale biological diversity. However, most had substantial demonstration and training programs, and their close association with economic interests and decisionmakers in the region were strong factors favoring biosphere reserve status.

Given these limitations, US-MAB developed the cluster concept, through which large conservation areas and much smaller experimental research areas would be paired to fulfill the multiple purposes of the biosphere reserve.

The United States announced its intention to establish an initial network of 16 biosphere reserves, most of them paired sites, at the I.C.C. meeting in September, 1974. During the next two years, US-MAB continued to identify suitable sites, which were submitted to the I.C.C. for official UNESCO designation in accordance with a standard nomination procedure agreed upon at its fourth meeting in November, 1975. The initial network of 29 biosphere reserves in the United States, officially designated by UNESCO in June 1976, included representation from 15 of the nation's 20 biogeographic provinces, and paired sites in seven.

From 1976 through 1978, the US-MAB Directorate on Biosphere Reserves held five regional workshops which brought together scientific and administrative personnel from biosphere reserves, agencies, universities, and other institutions to identify needs, objectives, and specific projects for individual reserves, and to develop a framework for coordinating activities at the regional, national, and international levels (U.S. National Committee for MAB, 1976, 1977a, 1977b, 1977c, 1978). Separate work groups developed recommendations to enhance the

role of the reserves in conservation of genetic diversity, research and monitoring, as well as education and training; and suggestions for completion of the network were presented. The workshops substantially increased understanding of MAB within both the public and private sectors; and many of the more than 100 recommended projects were subsequently implemented. Major initiatives were undertaken to synthesize information on biosphere reserves (Risser and Cornelison, 1979), and to develop pilot programs for integrated pollutant monitoring (Wiersma, Brown, and Crockett, 1978; Brown, 1981). Since 1978, workshops have been held to develop separate guidelines for identification and selection of biosphere reserves in terrestrial and coastal areas (Fernald and others, 1981; Bay and others, 1981); to improve certain specific biosphere reserve functions, such as long-term ecological monitoring (U.S. National Committee for MAB, 1979) and public communication (in preparation); as well as to develop cooperative programs involving biosphere reserves in other nations, notably Mexico (U.S.D.A. Forest Service, in preparation) and the Soviet Union (Henstrom and Franklin, 1981).

A MAB Consortium has been established for the purpose of providing grants for problem-oriented ecological research which furthers the mission objectives of three participating Federal agencies and four MAB Project Directorates (MAB 1, 2, 5, and 8). By signing the Consortium's charter, the Federal agencies agreed to fund the grant awards, which are made annually in amounts of up to $60,000 for projects lasting up to three years. In the 1981 fiscal year, $480,000 (U.S.) in grants were awarded, supporting 10 projects. The Consortium provides a unique vehicle for the United States to support innovative, relatively long-term, interdisciplinary, and often bilateral studies focused on the interrelationships between human activities and natural ecosystems--kinds of work which are often very difficult for agencies to carry out individually. The studies are intended to develop new perspectives on land use and management problems of regional, national, and sometimes international importance. With regard to the bilateral studies, it is worth noting that the Consortium funds the U.S. side of projects which have bilateral support. This distinguishes it clearly from technical assistance programs and promotes productive scientific relationships to which a substantial commitment exists on both sides. During the last two years, the Consortium has funded 11 research projects involving biosphere reserves.

CONDITIONS AND ACTIVITIES IN U.S. BIOSPHERE RESERVES

In order to provide an indication of the degree to which the 36 biosphere reserves in the United States are fulfilling their purpose, US-MAB conducted a survey of program managers in July-August 1981. A questionnaire was developed to provide information on scientific and related educational activities in each reserve, as well as the framework for its management, the relationship between its programs and anthropogenic threats, and its effectiveness as a conservation unit.

Because the purpose of reserve administration is known to have a strong bearing on its use and management, we decided to group the U.S. reserves into two categories on the basis of predominant management emphasis, in analyzing the survey data. One group consisted of 22 sites managed primarily for ecosystem conservation, such as national parks and monuments, national wildlife refuges, and equivalent reserves. They tend to be large, averaging 400,000 hectares in surface area (Figure 1, Table 1). Research is oriented toward maintaining and restoring natural ecological conditions or, in some cases, enhancing natural fish and wildlife values. The other group, consisting of 14 sites, is managed primarily for experimental research oriented toward sustaining or enhancing the productivity of managed ecosystems for human benefit. The reserves generally are of moderate size, averaging 18,000 hectares.

Our objective in the survey was to identify conditions and trends indicative of apparent problems and successes relating to the network as a whole. Individual reserves sometimes differed widely from the overall network in terms of their strengths and weaknesses, and we have not attempted to assess such differences, although particular reserves may be referenced in an illustrative context.

Table 1. Listing of Biosphere Reserves in the United States (as of August 1981)

Name of Reserve	State	Biogeographic Province and Coastal Region (where applicable)	Administrator[1]	Area in Hectares	Management Emphasis[2]	Year Designated by UNESCO (Dedicated)	Misc.[3]
Aleutian Islands National Wildlife Refuge	Alaska	Aleutian Islands (Aleutian-North Pacific)	FWS	1,100,943	C (E)	1976	
Beaver Creek Experimental Watershed	Arizona	Sonoran	FS	111,300	E	1979b	
Big Bend National Park	Texas	Chihuahuan	NPS	283,247	C	1976b	
Cascade Head Experimental Forest and Scenic Research Area	Oregon	Oregonian (Oregonian-Temperate Eastern Pacific)	FS	7,051	E	1976	IBP
Central Plains Experimental Range	Colorado	Grasslands - short grass	ARS	6,210	E	1976	IBP
Channel Islands National Park	California	Californian (Californian-Subtropical Eastern Pacific)	NPS	7,440	C	1976	
Coram Experimental Forest	Montana	Rocky Mountain - north	FS	3,010	E	1976b	IBP
Coweeta Hydrological Laboratory and Experimental Forest	North Carolina	Eastern Forest - south	FS	2,185	E	1976b	IBP LTER
Denali National Park	Alaska	Yukon Taiga	NPS	282,000	C	1976	
Desert Experimental Range	Utah	Great Basin - south	FS	22,513	E	1976	IBP
Everglades National Park	Florida	Everglades (Floridian-West Indian)	NPS	566,800	C	1976	
Fraser Experimental Forest	Colorado	Rocky Mountain - south	FS	9,328	E	1976	
Glacier National Park	Montana	Rocky Mountain - north	NPS	410,058	C	1976	

Table 1. Listing of Biosphere Reserves in the United States (as of August 1981) - Continued

Name of Reserve	State	Biogeographic Province and Coastal Region (where applicable)	Administrator[1]	Area in Hectares	Management Emphasis[2]	Year Designated by UNESCO (Dedicated)	Misc.[3]
Great Smoky Mountains National Park	North Carolina/ Tennessee	Eastern Forest - south	NPS	208,403	C	1976	
H. J. Andrews Experimental Forest	Oregon	Sierra Nevada-Cascade - north	FS	6,100	E	1976	IBP LTER
Haleakala National Park	Hawaii	Hawaiian (Insular-IndoPacific)	NPS	11,462	C	1980D	
Hawaii Volcanoes National Park	Hawaii	Hawaiian (Insular-IndoPacific)	NPS	92,934	C	1980D	
Hubbard Brook Experimental Forest	New Hampshire	Eastern Forest - northeast	FS	3,075	E	1976D	
Isle Royale National Park	Michigan	Eastern Forest - Canadian Taiga - transitional (Great Lakes)	NPS	54,144	C	1980D	
Jornada Experimental Range	New Mexico	Chihuahuan	ARS	78,297	E	1976	IBP
Konza Prairie Research Natural Area	Kansas	Grasslands - true prairie	TNC	3,487	C (E)	1979D	LTER
Luquillo Experimental Forest	Puerto Rico	Greater Antillean	FS	11,340	E (C)	1976D	
Niwot Ridge	Colorado	Rocky Mountain - south	FS	1,200	C	1979	IBP LTER
Noatak National Arctic Range	Alaska	Alaskan-tundra	NPS	3,035,200	C	1976	
Olympic National Park	Washington	Oregonian (Oregonian-Temperate Eastern Pacific)	NPS	363,379	C	1976	

Table 1. Listing of Biosphere Reserves in the United States (as of August 1981) - Continued

Name of Reserve	State	Biogeographic Province and Coastal Region (where applicable)	Administrator[1]	Area in Hectares	Management Emphasis[2]	Year Designated by UNESCO (Dedicated)	Misc.
Organ Pipe Cactus National Monument	Arizona	Sonoran - typical	NPS	133,278	C	1976	
Rocky Mountain National Park	Colorado	Rocky Mountain - south	NPS	106,710	C	1976b	
San Dimas Experimental Forest	California	Californian	FS	6,947	E	1976	
San Joaquin Experimental Range	California	Californian	FS	1,832	E	1976	IBP
Sequoia-Kings Canyon National Park	California	Sierra Nevada-Cascade - south	NPS	343,000	C	1976	
Stanislaus-Tuolumne Experimental Forest	California	Sierra Nevada-Cascade - south	FS	607	E	1976	
Three Sisters Wilderness	Oregon	Sierra Nevada-Cascade - north	FS	80,900	C	1976	IBP
University of Michigan Biological Station	Michigan	Eastern Forest - north central	University of Michigan	4,048	C	1979	
Virgin Islands National Park	Virgin Islands	Lesser Antillean (Floridian-West Indian)	NPS	6,130	C	1976	
Virginia Coast Reserve	Virginia	Eastern Forest - northeast (Virginian-MidAtlantic)	TNC	13,511	C	1979	
Yellowstone National Park	Wyoming, Montana, Idaho	Rocky Mountain - north	NPS	898,349	C	1976	

Table 1. Listing of Biosphere Reserves in the United States (as of August 1981) - Continued

Name of Reserve	State	Biogeographic Province and Coastal Region (where applicable)	Administrator[1]	Area in Hectares	Management Emphasis[2]	Year Designated by UNESCO (D=dedicated)	Misc
Pending designation:							
Big Thicket National Preserve (12 units)	Texas	Austroriparian	NPS	34,217	C		
Guanica State Forest	Puerto Rico	Greater Antillean	PR	4,015	C		

[1] Abbreviations:
ARS - Agricultural Research Service (U.S. Department of Agriculture)
BLM - Bureau of Land Management (U.S. Department of the Interior)
FS - Forest Service (U.S. Department of Agriculture)
FWS - U.S. Fish and Wildlife Service (U.S. Department of the Interior)
NPS - National Park Service (U.S. Department of the Interior)
PR - Commonwealth of Puerto Rico
TNC - The Nature Conservancy

[2] Predominant management emphasis: C = conservation, E = experimental research. Strong secondary emphasis indicated in parentheses.

[3] IBP - Research site for International Biological Program, 1965-1975
LTER - Pilot project site for long-term ecological research program of the National Science Foundation, 1980-

Figure 1 Biosphere Reserves in the United States

1. Beltsville Agricultural Research Center
2. Virginia Coast Reserve
3. Everglades National Park
4. Great Smoky Mountains National Park
5. Coweeta Experimental Forest
6. University of Michigan Biological Station
7. Isle Royale National Park
8. Konza Prairie Research Natural Area
9. Big Bend National Park
10. Central Plains Experimental Range
11. Rocky Mountain National Park
12. Niwot Ridge
13. Fraser Experimental Forest
14. Jornada Experimental Range
15. Yellowstone National Park
16. Glacier National Park
17. Coram Experimental Forest
18. Desert Experimental Range
19. Bonner Creek Experimental Watershed
20. Organ Pipe Cactus National Monument
21. San Dimas Experimental Forest
22. Channel Islands National Park
23. Sequoia and Kings Canyon National Parks
24. San Joaquin Experimental Forest
25. Stanislaus-Tuolumne Experimental Forest
26. H.J. Andrews Experimental Forest
27. Three Sisters Wilderness
28. Cascade Head Experimental Forest
29. Olympic National Park
30. Haleakala National Park
31. Hawaii Volcanoes National Park
32. Aleutian Islands National Wildlife Refuge
33. Denali National Preserve
34. Denali (Mt. McKinley) National Park
35. Luquillo Experimental Forest
36. Virgin Islands National Park

Nominated and Pending Designations:

A. Big Thicket National Preserve, Texas
B. Caribbean State Forest, Puerto Rico

(A more detailed description of survey methodology and results is available from the US-MAB Secretariat, Department of State, IO/UCS, Washington, D.C. 20520).

Status of Scientific Activities

In our survey, we asked field scientists to provide their perception of the adequacy of various scientific activities in the reserve to meet the present and reasonably foreseeable needs of scientists and managers. Activities were inventoried according to three broad types of scientific work: baseline information (30 activities), environmental monitoring (13 activities), and ecological research (39 activities). Our survey revealed a very high variability in the perceived adequacy of the reserves' scientific and management needs. Some reserves report many comprehensive activities while others indicated inadequate work in numerous areas.

The 14 experimental areas were rated more adequate than the much larger conservation areas for 53 of the 82 activities surveyed, presumably a reflection of their generally longer histories of scientific study. Work in the 22 conservation areas focuses heavily on assessment of anthropogenic threats to natural ecosystems. Newer lines of integrated ecosystem research, such as nutrient cycling and ecosystem modelling, are poorly represented in these areas. Experimental areas tend to receive higher ratings in activities strongly related to assessing or improving the productivity of managed ecosystems, including most of the activities in which conservation areas show very poor representation. Although activities in the two groups of biosphere reserves are often complementary, they are not often integrated, even for reserves in the same biogeographic province. Where integration occurs, it tends to involve only one or two activities. Participation in seven domestic and international data banks is low. Most reserves

participate in not more than two of these systems. None are involved in UNEP's Global Environmental Monitoring Programme. The survey suggests that most of the reserves are, for practical purposes, essentially autonomous study units.

A few of the study areas stand out as very poorly represented in the network as a whole: aquatic ecosystems, soil ecology in conservation areas, wildlife genetics, air pollution impact, and ethnobotany. Lack of information in these areas could impair the capability of the reserves to conserve genetic resources and habitats in the face of increasing human-caused threats.

Michel Batisse (1981) has emphasized that the success of MAB may well depend on its ability to carry out projects which provide perspective on global or broad regional problems. He has stressed the desirability of developing regional networks of integrated pilot projects through which significant field studies with research, demonstration, and training components provide the focus for cooperation at the domestic and international levels. As MAB's permanently protected sites for carrying out baseline and experimental study, the biosphere reserves should play a key role in this mission. However, a few noteworthy initiatives notwithstanding, the biosphere reserve network in the United States is not contributing very effectively in this area.

The problem seems to be due in part to the fact that the U.S. reserves do not have an independent management identy. Lacking their own legal protection, the biosphere reserve depends on the surrogate protection provided by the administrator's authorities, policies, and regulations. Their purposes thus tend to be achieved only to the extent they promote the administrator's mission. Because these missions are sectorial, the biosphere reserve programs tend to be directed toward limited objectives relating to a particular site, region, or

area of inquiry.

The number of linkages among the programs is disappointingly small. Our survey revealed that, of the 36 U.S. reserves, 23 are involved in on-going cooperative monitoring or research with a regional institution, 14 in cooperative domestic undertakings with another biosphere reserve, and only three in international projects. Many of the linkages are focused on a single activity. Instances of integration of demonstration and training into these programs are substantially less than the number of reported projects.

Increasing use of biosphere reserves as focal points for domestic ecological research, as well as Federal efforts to develop and standardize resource inventory and ecological monitoring methodologies, should contribute to improved domestic coordination. International coordination of reserve activities will present a more formidable challenge.

Facilities, Staffing and Funding

Our survey results indicate that a reasonable level of basic facilities to support scientists' work are available in most, but not all, of the biosphere reserves. Twenty-five of the 36 reserves can provide lodging accommodations; 28 have permanent field stations, including 20 with "dry" lab and 15 with "wet" lab facilities. Most reserves have permanent plots for long-term observational and, in the experimental areas and a few conservation areas, manipulative research. We do not have information on library and specific data processing capabilities, although we know that facilities exist in most areas, but operations vary widely in adequacy.

Figure 2 shows trends during the last five years in the average number of scientific staff positions, by education level, for conservation and experimental areas. The results demonstrate steady improvement in staffing, particularly for masters and doctoral level personnel in the conservation areas. Staffing generally showed small increases for the experimental areas, although there were minor year-to-year variations in the direction of changes. The data suggest that, even though conservation areas lag far behind experimental areas in staffing, conservation area administrators are giving considerable attention to the development of in-house scientific capability, presumably to provide information to help deal with increasing human-caused threats to these areas. There is an obvious positive relationship between a large science staff and high average index ratings for science programs. The seven reserves with the largest scientific staff (≥10 positions) all fall within the top-rated sites in the survey. However, although reserves with small (≤3) or no science staffs tended to report low index ratings, there was considerable variation in these ratings, perhaps due to differences in the use of the reserves by outside investigators. Thus, it appears that a large multidisciplinary staff capability is consistently associated with exemplary science programs, but that the lack of a large staff does not necessarily assure serious inadequacies.

Since 1977, the average funding level for scientific study in biosphere reserves has increased about 22% in the experimental areas and about 93% in the conservation areas (Figure 3). The survey data indicate significant growth, after adjustment for inflation, in the average budget for the conservation areas and a slight decline for the experimental areas. In 1981, no funding was allocated for scientific study in two areas. Funding elsewhere was between $10,000 and $100,000 (U.S.) in 12 reserves, $101,000 and $400,000 in eight, $501,000 and $1 million in four, and more than $1 million in two. During the five-year

Professional Staffing of U.S. Biosphere Reserves, 1977-1981

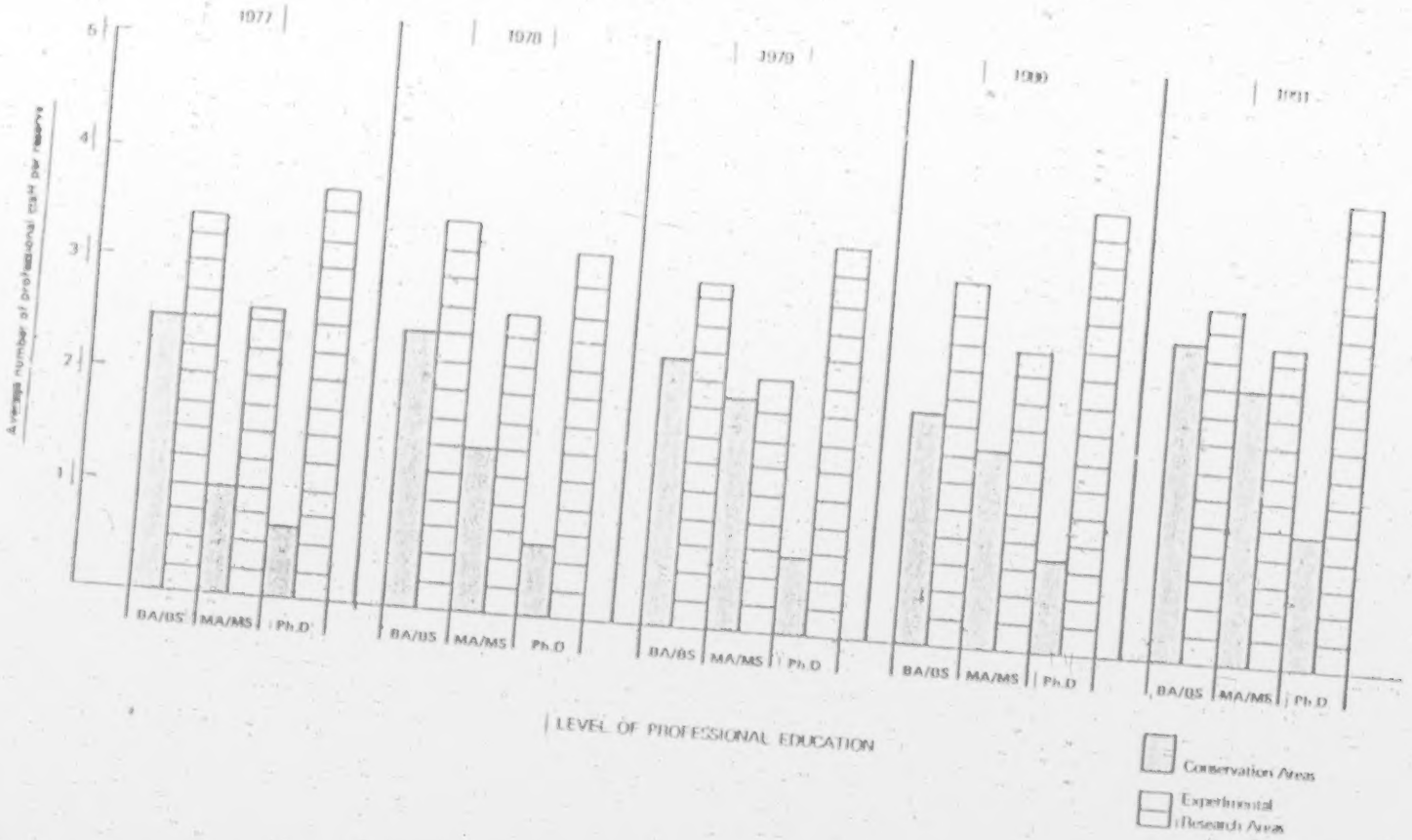
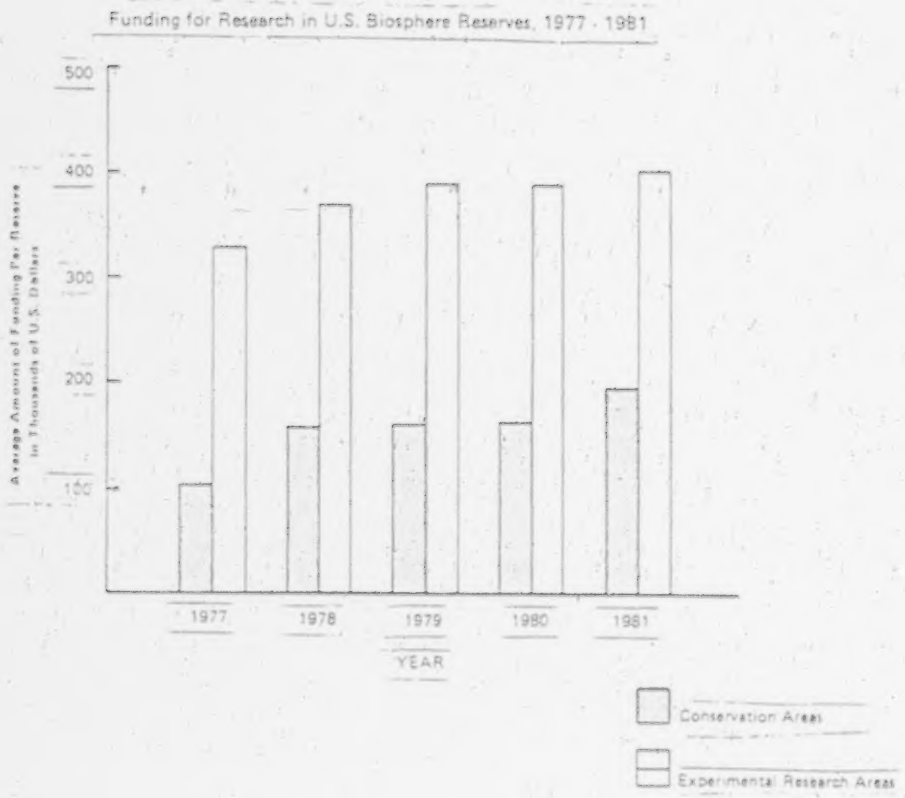


FIGURE 3


Funding for Research in U.S. Biosphere Reserves, 1977 - 1981
Average Amount of Funding Per Reserve in Thousands of U.S. Dollars
500
400
300
200
100
1977
1978
1979
1980
1981
YEAR
Conservation Areas
Experimental Research Areas

period surveyed, three reserves, all designated in 1976, received funding for the first time. Although the large differences among reserves limit the value of generalizations, the data suggest that a "typical" biosphere reserve in the United States has accommodations and laboratory support facilities, supports about eight staff positions including two to three doctoral level scientists, and has an annual science budget of about $300,000 (U.S.).

Anthropogenic Threats and Effectiveness in Conservation

Information was requested on 49 anthropogenic threats in six categories. Table 2 provides an overview of the extent to which each of the surveyed threats was reported as a known or suspected problem in the biosphere reserve network. The results show that the threats affecting the reserves are many and widespread, and that the majority of reserves in the network is affected or potentially affected by two or more threats in each category. For 82% of the threats, a known or potential problem was indicated by a greater percentage of conservation than experimental areas. Much greater percentages of the conservation areas (≥20%) reported threats for the majority of operations activities: illegal collection of biological and archaeological material; visitor-caused soil erosion and wildlife disturbance; exotic animals and plants; and water quality impacts from sewage, toxic materials and oil spills. Most of these differences appear to reflect the management emphasis on visitor use in the 15 national park areas, resulting in a higher probability of impacts associated directly with visitor activities, and development and park operations related to these activities. More frequent reports of exotic species problems may be a function of the much larger size of these areas, and possibly a heightened awareness of such problems by conservation area respondents. A greater percentage of reporting experimental areas was associated with only nine threats, and substantially greater percentage (≥20%) only for hunting and logging--both activities which are not legally

Table 2. Percent of Biosphere Reserves Reporting Particular Threats (August, 1981)

Threat	Percent of Biosphere Reserves Reporting Documented or Suspected Threats		
	All Reserves (n=36)	Conservation Areas (n=22)	Experimental Areas (n=14)
AIR POLLUTION			
Acid rain	78%	82%	71%
CO_2	56	59	50
CO	61	59	68
$(CH_2)_x$	69	73	64
NO_x	67	68	64
Radioactivity	39	36	43
Other	50	64	29
EXOTIC ENCROACHMENT			
Animals	61	73	43
Plants	67	68	64
Unnatural fire	72	73	71
Weather modification	19	23	14
Other	0	0	0
OPERATIONS			
Employee ignorance	44	59	21
Facilities	44	59	21
Inadequate management plan	42	55	21
Misuse of biocides	28	27	29
Political pressure	53	59	43
Research	47	50	43
Roads and utilities	69	77	57
Suppression of natural fire	64	68	57
Trails	50	59	36
Other	0	0	0
PHYSICAL REMOVAL OF RESOURCES			
Archaeological resources	53	59	43
Fishing	67	73	57
Grazing	61	64	57
Hunting	67	59	79
Logging	36	18	64
Mineral extraction	42	36	50
Oil and gas	22	23	21
Soil erosion	72	68	79
Specimen collection	58	64	50
Other	8	9	7
PHYSICAL IMPACTS OF VISITOR ACTIVITIES			
Campfires	64	73	50
Erosion	67	77	50
Habitat impacts	47	50	43
Off-road vehicles	50	55	43
Subtle influences	31	32	29
Trampling	56	59	50
Impacts on wildlife	67	77	50
WATER POLLUTION/HYDROLOGY			
Acid mine drainage	14	18	7
Changes in geothermal features	22	27	14
Chemical pollution	36	36	36
Erosional deposition of sediment or salt	33	27	45
Oil spills	22	36	0
Radioactivity	22	18	29
Sewage pollution	28	41	7
Toxic materials spills	22	36	0
Unnatural flooding or decrease in surface flow	42	54	36
Other	19	32	0

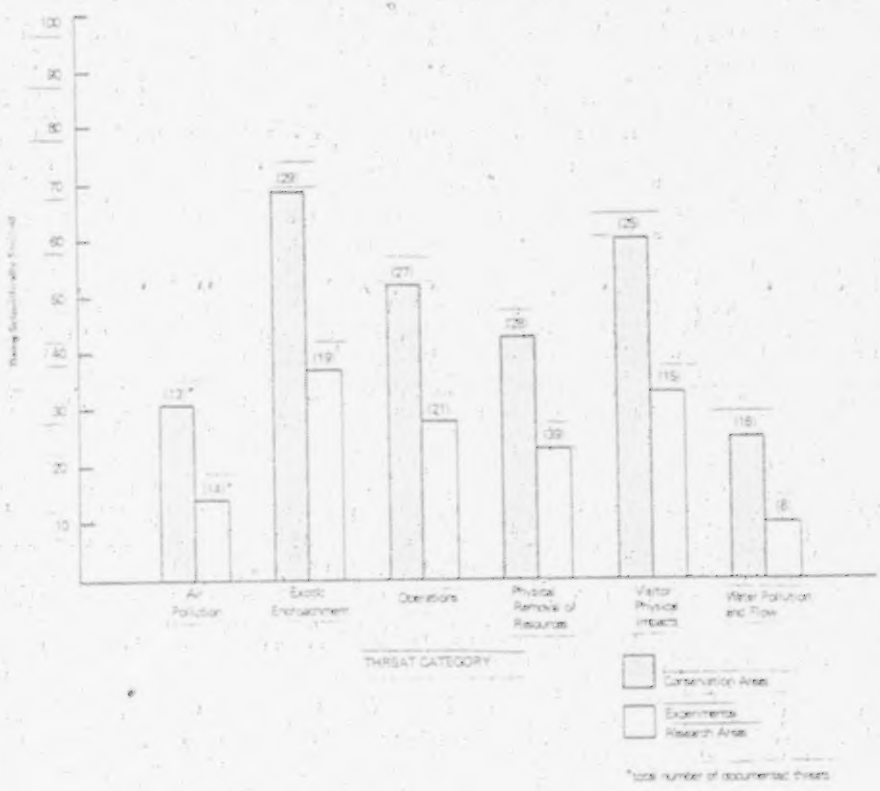
permitted in the conservation areas.

Not only are more threats reported for conservation areas, but a greater percentage of the reported threats are being addressed through a science or management program than in experimental areas (Figure 4). Intergroup differences exceeded 30% for all categories except air pollution. Thus, although science programs are rated as much less comprehensive in the conservation areas, they are much more likely to be focused on detection and assessment of anthropogenic threats than in experimental areas. The growing number and seriousness of such threats, and the increasing awareness of this trend by conservation area administrators, has most likely been responsible for rapid closing of the gap between conservation and experimental areas in terms of staffing and funding for scientific study.

We asked respondents to evaluate the effectiveness of the reserves in providing long-term protection of ecologically significant units of the earth's surface, and in protecting particular groups of plants and animals. Most of the resources surveyed were viewed as effectively protected in the reserves. As expected, ratings tended to be highest for ecological units which are frequently included completely within the reserves, such as watersheds, mountain masses, lakes, and islands. Large-scale units, such as airsheds and estuaries, which typically extend well beyond reserve boundaries, received lower ratings. For biological resources, effectiveness ratings were higher for resident than for migratory wildlife, and higher for small than large animals, as expected. Protection was considered generally effective for rare and endangered plants and animals. Fish--increasingly affected by acid precipitation, competition from exotics, and water pollution--were given the lowest rating in the experimental areas, and second only to wide-ranging mammalian predators in the conservation areas.

FIGURE 4

Status of Scientific Documentation for Reported Threats to U.S. Biosphere Reserves



The respondents' perception of threats and the degree to which their reserve's scientific activities are focused on addressing them appear to influence their views on the effectiveness of the reserves as conservation units. The experimental area respondents rated their reserves as considerably more effective in conservation than the respondents from conservation areas. This occurred for all ecological units except for estuaries, islands, and lakes, and for all biological groups except small mammals. Even airsheds and wide-ranging predatory mammals were considered more effectively conserved in the experimental areas. Because their research often deals substantially with threats, conservation area respondents are probably more keenly aware of anthropogenic influences which impinge on conservation effectiveness, and thus may be more inclined to assign lower ratings. However, in view of the inadequate level of documentation for most threats, it is impossible to determine from the survey whether the low ratings for the conservation areas reflect actual conditions or merely a heightened sensitivity to potential problems.

Regardless of the reasons for the discrepant results, it is clear that improved guideposts for evaluating the effectiveness of protected areas in assuring long-term conservation at the ecosystem, species, and population levels are urgently needed to provide a basis for management.

Professional Training

The amount of professional training activity is considerable, and occurs about equally in conservation and experimental areas. Of the 36 biosphere reserves, 26 are being used in varying degrees for undergraduate, and 30 for graduate, instruction. Twenty of the reserves are sites for training programs to improve the scientific and resource management capabilities of administering government

agencies, and three are planning to implement such programs. Sixteen support professional workshops, conferences, and symposia on a regular or periodic basis, and four more are planning to initiate such activities in the future.

Bilateral activities with other nations are poorly represented in the professional training programs of U.S. reserves. Only five sites report ongoing training programs involving other nations. Four additional reserves anticipate future initiation of bilateral cooperative activities involving Mexico, Canada, and the USSR, in conjunction with broader programs of scientific cooperation.

Public Communication

Biosphere reserves can play an important role in fostering public awareness of environmental problems and the role of science in addressing them. They can also help promote public recognition and support of MAB and the effective use of biosphere reserves as focal points for domestic and global cooperation to assure sustained conservation of biological resources.

The U.S. biosphere reserves are major centers for public communication. In many of the experimental areas, considerable communication focuses on the reserve's scientific and management programs, and how they are contributing to improved management practices to reduce adverse environmental impacts and increase the productivity of managed ecosystems. Some activities are of an extension service nature, and oriented toward meeting the needs of foresters, cattlemen, and other special groups. The number of visitors to these reserves is not large. However, our survey respondents indicated that these visitors are, nevertheless, about four times as likely to find out about MAB and its concerns as visitors to the conservation areas.

Most conservation areas are national parks and monuments, and use a wide variety of media, facilities, and activities in public communication. In 1980, they received 27 million visitors. However, only 10% of the conservation areas provide public communication on MAB (38% for experimental areas). About 30% of these reserves address global environmental problems to some degree (about the same as for experimental areas); 65% discuss regional or national problems (vs. 44% for experimental areas); 70% communicate information about science activities in the reserve (vs. 63%), and 95% provide traditional interpretation of the reserve's natural history (vs. 69%). Four reserves report no public communication activities or facilities.

Major opportunities are apparently being missed to communicate information about interactions between human activities and natural ecosystems, and to link activities in the reserve with problems of regional, national, and global importance. The facilities and capabilities are already in place in most of the conservation, and many of the experimental, areas to take advantage of these opportunities.

Most respondents expressed reservations about the effectiveness of their public communication program in conveying information about MAB, biosphere reserves, and interrelationships between human activities and the biosphere. About 70% of the conservation and 77% of experimental area respondents rated the reserves' programs as less than effective in these areas. A surprising 97% of the respondents felt that guidance from MAB would be of potential or definite value.

A recent US-MAB workshop on public communication in biosphere reserves revealed that reserve personnel are often uninformed about MAB, biosphere reserves, and their role in dealing with regional, national, and global problems. A better informed reserve staff was viewed as key to more effective public communication. The workshop produced a set of guidelines, in question-and-answer format, to help reserve administrators develop public communication programs, and reached agreement on a number of recommendations, some with potential applicability internationally (proceedings available from US-MAB Secretariat).

SOME FUTURE DIRECTIONS

Classification

Our experience with the Udvardy system of biogeographic classification (Udvardy 1974) has been generally favorable, particularly when used in conjunction with the selection of a single reserve or reserve cluster within a large geographic area. However, the boundaries of the classification units do not always precisely reflect the variations in climate, substrate, physiography, and vegetation which are the most influential in controlling ecosystem structure and function at the regional level. For this reason, systematic review of the ecosystems of a particular biogeographic province for biosphere reserve selection often requires adjustment of the province boundaries to fit the present state of knowledge regarding these ecosystem controls.

Urgent attention needs to be given to the matter of biogeographic classification in coastal regions as the Udvardy system is not suitable for use here. To develop a basis for coastal biosphere reserve selection in the United States, a US-MAB expert panel was convened in 1980. Major tasks included developing a working definition and classification system for use in selecting reserves in the coastal zone. The panel agreed to define the coastal zone as having a terrestrial boundary "defined by (a) the inland extent of astronomical tidal influence or (b) the inland limit of penetration of marine aerosols within the atmospheric boundary layer and including both salts and marine aerosols, whichever is greater" and a seaward limit "defined by (a) the outer extent of the continental shelf (approximately 200m depth) or (b) the limit of U.S. territorial waters, whichever is greater." This definition includes onshore, nearshore, and oceanic ecosystems controlled by maritime and marine influences. An easy-to-use two-dimensional classification system was agreed upon which identifies twelve

coastal regions based on terrestrial-nearshore and oceanic characteristics and 17 widely recognized ecosystem types based on abiotic and biotic characteristics, which are potentially represented within the coastal regions. The classification system, which is similar in general structure to others developed for conservation purposes (Ray, 1975; Cowardin and others, 1979), is now being tested on an experimental basis in selection of biosphere reserves in the Carolinean-South Atlantic Coastal Region.

Selection Criteria

Our recent experience in the United States suggests that, when a good level of ecological information exists, the need to select a relatively large number of sites to obtain a representative diversity of ecosystems will be obvious from the start of the selection process. For this reason, new US-MAB guidelines encourage the selection of biosphere reserves consisting of multiple sites, and specifically allow a number of such reserves, normally not more than four, to be established within each province. US-MAB's recent nomination of the 12-site Big Thicket National Preserve in east Texas exemplifies this trend.

The multiple site biosphere reserve, linking individually qualified ecosystem units under the same or different administration within a single biosphere reserve designation, helps assure a level of ecosystem representation not normally possible with single site reserves or through the cluster concept. The great majority of the sites in multiple site reserves will be minimally disturbed ecosystems, sufficiently expansive to facilitate ecosystem-level research. Many of the sites are expected to be administered by non-Federal governmental agencies or private institutions. Some will have a substantial history of research in part of the protected area, but many will illustrate only a potential

for such work. Periodic review of biosphere reserves is encouraged to provide for boundary adjustments, and the addition of sites under the multiple-site concept, as required to fulfill the purposes of the reserves. Unique areas, degraded landscapes especially suitable for restoration research, traditional human use areas, and other sites of exceptional research and educational value could be considered in such reviews for integration into the larger reserves.

Although it is difficult to predict the ultimate size of the U.S. network, it is clear that protection of a representative diversity of major ecosystems will require designation of several reserves in most, if not all, selection areas. In many cases, the individual reserves will themselves consist of two or more sites. A not unreasonable average of three reserves per biogeographic province and one per coastal region would yield a total U.S. network of 72 units, or about twice the size of the present system.

Selection Procedures

The US-MAB Directorate on Biosphere Reserves has developed new guidelines for selection of biosphere reserves (Fernald, E.A., and others, 1981; Ray, G.C., and others, 1981), which provide a systematic approach for identifying candidate sites, summarizing relevant information, evaluating sites relative to UNESCO criteria and recommending nominations.

The cornerstone of the procedure is an ad hoc multidisciplinary panel of scientists and resource managers possessing preeminent knowledge of the ecosystems of a particular biogeographic province. The panel normally consists of four to seven members, representing land managing agencies, universities, and other institutions, as appropriate, to develop balanced perspectives on the

qualifications of candidate sites. The panel has considerable flexibility in identifying the factors to be used in describing and comparing the ecological features and conditions of candidate sites in a province, as well as the format for displaying this information. However, once these factors have been agreed upon, a disciplined procedure assures a high degree of objectivity and consistency in rating and selecting sites. The panel uses its discretion in determining how the identified factors will be considered in evaluating candidate sites against UNESCO criteria; it also has considerable latitude in adjusting the boundaries of the biogeographic province, and in subdividing the province into ecological regions for selection purposes. Specific guidance for carrying out these functions is not provided. However, our limited experience in testing the new guidelines indicates that well-informed panels can readily reach agreement on the basic framework for selection.

Once the candidate sites have been identified and the framework for selection developed, panel members prepare descriptive factor summaries for those sites with which they are most familiar. These summaries involve the numerical scoring of certain factors based on the quality of the factor, or alternatively, an indication of whether a particular factor is present or absent. The descriptive factor summaries, along with supplemental information and analysis, are then used by the panel to evaluate the sites relative to UNESCO criteria.

The procedure for evaluation involves the rating of each site, or group of sites, relative to five criteria, which are weighted according to their relative importance in selection. Representative diversity at the ecosystem level, a single criterion combining the two closely interrelated essential criteria established by UNESCO, is accorded the greatest importance (weighting factor 10), followed by effectiveness as a conservation unit (3), naturalness (3), education and

research value (2), and uniqueness (2). A five-point rating system is used consistently to record the extent to which each site satisfies each criterion. The total site rating score is the sum of the products of the rating for each criterion and the weighting factor for the criterion. The maximum possible score is 100.

Upon completion of the selection process, a report documenting the rationale for site selection and including all descriptive and evaluative materials is submitted, along with site nomination forms, to the US-MAB Directorate on Biosphere Reserves. The Directorate then reviews the report and recommends nominations to the U.S. National Committee for MAB, which obtains the site manager's concurrence and a statement of intent to pursue three general goals:

- to encourage multidisciplinary scientific studies leading to improved understanding, management, and use of natural and managed ecosystems;
- to coordinate systematic planning for scientific, educational, and resource management activities in the area;
- to avoid undertaking or authorizing actions which would significantly impair the value of the reserve for research and educational purposes.

Once these assurances have been received, the Committee forwards the nomination to the International Coordinating Council for action on designation.

Based on the results of preliminary testing, the procedure seems to work well in the United States, where a sufficient level of ecological information is usually readily available to support comparative analysis of sites. Its application in situations where information gaps are large remains to be determined. However, the use of *ad hoc* expert panels to develop nominations by consensus would seem to be of universal value in improving the objectivity of site selection.

Development of Scientific Capabilities

A major impediment to the effective use of biosphere reserves is a lack of a compendium of summarized information on each reserve's past and present scientific activities as well as its facilities, data management capabilities, and institutional interrelationships.

In August, 1980, a prototype study was initiated in the Great Smoky Mountains Biosphere Reserve. In the first phase of the study, an annotated bibliography for the reserve and its immediate vicinity was prepared. Using these references, a summary of the scope, methods, and importance of previous work on particular topics was developed and forwarded to authorities on the ecosystem of the region, who were requested to supply additional references and to revise the summaries as necessary. These individuals were also asked to recommend, from their disciplinary points of view, actions needed to make existing scientific programs more effective in characterizing the structure and function of the reserve's ecosystems, and in enabling the administrator to detect and deal with adverse changes in a timely and cost effective manner.

Recommendations were synthesized and a revised report sent to selected reviewers who made substantive recommendations based on the earlier material. An interdisciplinary workshop was then scheduled, bringing together scientists, the reserve administrator, and other governmental agencies to identify and prioritize needed actions, with particular attention given to identifying opportunities for cooperation with other agencies and institutions.

The overall effort involved more than 90 scientists and provided a framework for developing a phased, balanced science program for the biosphere reserve.

Because the assessment's format provides for easy updating, its value should continue indefinitely. We believe this approach provides a highly effective and relatively inexpensive way to promote improved scientific and educational use of biosphere reserves, improved coordination at all levels, and more efficient expenditure of limited research funds. Similar assessments are scheduled during the next year in four additional reserves.

Genetic Resources Protection and Management

US-MAB, in association with various Federal agencies, is co-sponsoring two major workshops dealing with genetic resources. The first of these, scheduled for November 1981, is intended to develop perspective on the problem of declining global genetic diversity. Specifically, it will bring together scientists, resource managers, and agency administrators to assess the causes and magnitude of the problem; its economic, social, ecological, and political ramifications for the U.S. and other countries; the status of institutional capabilities; and the effectiveness of existing U.S. policies in dealing with the problem. The workshop will also recommend initiatives to promote domestic and international efforts to maintain biological diversity.

The second workshop, scheduled to be held in Washington, D.C. from August 9-13, 1982, is intended to provide new perspective on the potential for managing the genetics of biological resources, with principal emphasis on the world's temperate zones. It will address problems in managing wild animal and plant populations as protected areas become progressively more isolated due to changes in peripheral land use and human activities which interfere with historical patterns of gene flow. Topics will include species declines and extinctions, the founding of new populations, the merging of separated populations, and maintaining the

natural diversity of populations and taxonomic units. The workshop will identify gaps in our knowledge, and develop recommendations for interim management practices that could be implemented immediately, as well as for future study to provide a basis for mitigating adverse conditions and trends known to be occurring or anticipated in protected areas. Eminent authorities in basic and applied sciences will provide their perspectives to an audience of resource managers, policymakers, and representatives from interested organizations and foreign governments, with the objective of bringing relevant information from diverse fields to bear on more effective management of biological resources in a rapidly changing world. Government and private sector responses to this MAB initiative have been overwhelmingly positive. At this writing, four Federal agencies and 12 scientific and conservation organizations have agreed to co-sponsor the workshop, and many are providing financial support. Complementary to these workshops will be a major MAB publication on the cultural significance of the world's natural genetic resources. Scheduled for publication in 1982, this work summarizes a wealth of practical information to support global efforts in genetic conservation.

CONCLUSIONS

During the upcoming second decade of MAB, the United States' expanding network of biosphere reserves will play an increasing role in the development of new scientific and technological capabilities to assess the causes and effects of changes in natural and man-modified ecosystems. Much improved standardization and intercalibration of inventory and monitoring methods will vastly increase our capability in comparative analysis of different ecosystems. As our understanding of the structure and function of ecosystems continues to increase, predictive ecosystem modelling will come into its own as a practical, reliable, and cost effective tool of land management. Research in biosphere reserves will make major contributions in providing the basis for intensive management of habitats and genetic resources on an unprecedented scale, as biological refugia become progressively more isolated by regional land use changes and human activities.

We recognize that the social, economic, and political context of conservation in the United States is unique, and that scientific and management advances made within this framework often do not apply to the situations of other nations. Nevertheless, there are many instances where these advances can be applied or adapted to other situations, and it is in this area that the U.S. biosphere reserves can contribute most effectively to the solution of global problems through professional communication, coordination of related scientific activities, demonstration, and training. For the immediate future, the major challenge will be to find ways to support these activities under the prevailing conditions of global economic difficulties, which are increasing the sectorialism in governments and institutions, resulting in higher priority on furthering short-term national interests at the expense of the long-term interests of mankind.

We are rapidly entering an era in which technology may well permit us to sustain conservation and development in ways which assure a life of dignity for each of the world's citizens. However, technology can only be as effective as our will to direct it unselfishly toward the good of all mankind. In the context of an increasingly sectorial world, our best hope may lie in awakening the nascent yearnings of individuals and nations for a better world civilization, based on justice and the fundamental unity of the human race, in which the ideals of our speech become the reality of our actions.

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Mr. MACKAY. Mr. Wiersma.

Mr. WIERSMA. Thank you, Mr. Chairman. I brought some visual aids I would like to use in my presentation, if I could have a hand being hooked up.

Since 1978, I have been associated with colleagues from the U.S. Forest Service, the National Park Service, and the national atmospheric deposition program to try to develop a joint monitoring program with our Soviet colleagues based around the biosphere reserves.

Today, before I tell you about that program, I would like to describe why the reserves are important for monitoring purposes; to tell you a little bit about what we have done on the biosphere reserves and then show how that leads into our work with the Soviets.

The reason for using biosphere reserves for environmental monitoring are: One, we can establish reference levels of pollutants on those reserves; two, they can serve as places of comparison for changes that may be occurring in more impacted areas; three, we may be able to detect changes in pollutants of a global nature in these background areas much quicker than we could possibly find these in more impacted areas.

In other words, they can serve as an early warning system. Now, our research objectives in studying the biosphere reserves were as follows: first, to develop cost effective, analytical and sampling techniques that would still allow us to detect the relatively low levels of pollution that we expected to find in these reserves.

For example, this is a back-pack mounted, air monitoring device, which we have found to be extremely rugged, reliable and sensitive to pollution levels in these national parks. This unit is powered by a solar panel and a small battery-operated unit.

Virtually all the biosphere reserves that we have studied to date have been national parks and our work has been funded by the National Park Service. The three reserves that we have worked on were the Great Smoky Mountains National Park, on the border of Tennessee and North Carolina; Glacier National Park in Montana; and Olympic National Park in Washington State.

This is the Ramsey Cascade. It is a beautiful stream on the northeastern quadrant of the Great Smoky Mountains National Park. We had two sampling sites along this drainage in which we sampled water, vegetation, soil, litter, and atmospheric samples.

This is part of our study site in Glacier National Park. It is located in Logan Pass, about a mile and a half from a very popular visitor's center. We do not worry too much about access to the site from inquisitive tourists since access is limited to technical climbing gear to get down inside this first valley.

This site represents perhaps our most pristine and remote site. It is located at the headwaters of the Hoh River in Olympic National Park in Washington State. Mount Olympus is right here. This is Mount Tom. This is the White Glacier. It is about 39 trail miles from the nearest trail head.

These reserves were originally put aside because of their supposedly pristine nature. Unfortunately, the data that we have generated in these reserves has indicated that they are not truly pristine.

Each of these reserves is contaminated, relatively speaking; Great Smoky Mountains being the most contaminated, followed by Glacier National Park, with Olympic National Park by far being the cleanest of the parks.

However, even in Olympic National Park in sites similar to this at the upper headwaters of the Hoh River, we have found contamination.

For example, these are air samples for trace elements. For lead, we have a factor here of 95. Now, this is a rough index. That is all it is. But what it tells us is that the lead we found in our air sample is approximately 95 times higher than we would have expected if we had been merely sampling resuspended material for local sources.

What this implies is that the lead source is probably from outside the park. You see, lead has a long-term transit characteristic and can literally travel in the atmosphere for hundreds and even thousands of miles.

The second thing that it implies to us is that it probably has an anthropogenic source.

The counterpoint to this, two elements not known to have long-term transport characteristics, which settle out of the atmosphere rapidly, calcium and titanium, had enrichment factors or indices are very close to one, indicating they are local sources.

What the effect of these elevated enrichment factors is on these remote ecosystems, we don't know. But what it does demonstrate to us is that these sites can be used for determining and tracking background pollution levels. This has led us directly to our work with the Soviets.

In addition to expanding, in general, our global environmental cooperation with the Soviet Union, we had specifically in mind with the Soviets to work on a series of their reserves to study their ecological monitoring techniques and their pollution monitoring techniques.

Recently I headed a five-person delegation to the Soviet Union in which we visited three of their biosphere reserves. These were the Priokso-Terrasny Reserve, the Voronezh Reserve, and the Caucasus Reserve.

The Priokso-Terrasny Reserve is located about 100 kilometers south of Moscow, along the banks of the Oka River, right across from the Soviet Academy of Sciences' Science Biology City. It is a mixed hardwood, softwood forest. If you are familiar with the forests, say, of Maine, northern New York State, central Michigan, you would feel very much at home in this forest type.

The second reserve that we visited in the Soviet Union is the Voronezh Reserve. It is about 300 kilometers south of Moscow.

It is a mixed hardwood forest. Again, you could find this kind of forest in the United States, relics of it, at least, in parts of Ohio or Indiana. It looks very much like our great central hardwood forests once did.

The final reserve that we visited and worked on with the Soviets was the Caucasus Biosphere Reserve located along the north side of the Black Sea. As you can tell, this is a mountainous reserve.

These mountains range up to heights of over 13,000 feet. It is a mixed, very richly forested Biosphere Reserve starting with hard-

wood forests at the lower elevations, moving to subalpine and alpine forests at the upper elevation.

Now, our impression of the Soviet work we observed, and we were there to look at both ecological monitoring, as I said, and pollution monitoring was as follows.

On the ecological monitoring the Soviet work tended to be classically oriented. By that I mean they emphasized observations over processes. In the United States, our ecological studies tend to be systematic and we emphasize studies of processes rather than mere observations.

In the pollution monitoring area, I feel quite confident that the Soviets can work with us and provide us with reliable and comparable data.

For example, this is a Soviet wet fall/dry fall collector for measuring atmospheric fallout. It is in operation at the background pollution monitoring station in the Caucasus Biosphere Reserves. It is very similar to the kind of instrument that we use in the United States to measure wet fall/dry fall in the national atmospheric deposition program, which is a key element of tracking acid rain in the United States.

I believe, as I said, that we can work effectively with the Soviets, particularly in the pollution monitoring area. If we can establish a workable quality control that will insure our data is reliable, then we can put together a meaningful, joint program with the Soviets on paired, ecologically similar biosphere reserves. The measurements will be on certain ecological parameters and measuring certain pollutant levels.

Over the last 10 years, a considerable amount of discussion has taken place in international meetings, starting, really, at the Stockholm conference in 1972, on the establishment of a background monitoring network based around the biosphere reserves.

Recently through the support of UNESCO MAB, UNEP GEMS, a global environmental monitoring system, and the U.N. World Meteorological Organization, a three-station pilot network has been funded.

I am firmly convinced that the work with the Soviet Union and the United States on their joint biosphere program was instrumental in getting this three-station pilot network and giving it life, because one site will be in the United States, one site will be in the U.S.S.R., and the UNESCO MAB, UNEP GEMS' contribution will fund a site in a less developed country, possibly Chile.

I also believe that this three-station pilot network is a realistic first step toward the eventual implementation of a true global background monitoring network, and I feel that the man and the biosphere program has made a significant contribution to this, if for no other reason than as a coordinating function.

So, thank you very much, Mr. Chairman.

[The prepared statement of Mr. Wiersma follows:]

Statement of

G. Bruce Wiersma

Manager, Earth & Life Sciences, EG&G Idaho, Inc.

and

Chairman of the Man and Biosphere Directorate on Environmental Pollution

before the Subcommittee on Natural Resources,

Agriculture Research and Environment,

Committee on Science and Technology,

House of Representatives

April 5, 1983

Since 1978, I have been working in cooperation with the U.S. Forest Service (Dr. Jerry Franklin), the National Park Service (Dr. Ray Herrmann), and the National Atmospheric Deposition Program (Dr. Jim Gibson) on developing a joint monitoring program for both ecological processes and pollutants with our Soviet colleagues. Before I describe our work with the Soviets, I must describe why biosphere reserves are important for environmental monitoring, and also present a brief statement on our current research on biosphere reserves in the U.S.

We are interested in monitoring pollutants and certain ecological parameters on biosphere reserves because these reserves: (1) act as locales for establishing levels of pollutants; (2) they provide a frame of reference against which changes in more impacted areas can be compared; and (3) the biosphere reserves may reflect changes in pollutant levels of a global nature long before such changes are obvious in more impacted areas. In other words, they can serve as an early warning system for pollutants transported over long distances.

Our research objectives in studying the reserves were: (1) to develop sampling and analytical techniques that were both sensitive enough to detect pollutants in these remote areas, but at the same time were cost effective. For example, one of the sampling techniques we developed was a portable backpack mounted solar powered air monitor which has proven to be very effective and reliable for use in long periods of time in remote areas; (2) to establish, for

certain types of pollutants, particularly trace elements, reference levels of these pollutants in selected U.S. biosphere reserves. The biosphere reserves that we have worked in were all national parks* and included the Great Smoky Mountains National Park, Olympic National Park, and Glacier National Park.

While these biosphere reserves were set aside supposedly because they were pristine areas, truly none of these three reserves, in my opinion, can be classified as pristine. The most contaminated of the reserves that we have worked in is the Great Smoky Mountains National Park, followed by Glacier, with Olympic National Park by far being the cleanest.

Unfortunately, even Olympic National Park samples collected 20 miles from the nearest road in the most remote and wild parts of the park showed contamination. For example, shown below are enrichment factors calculated from air samples for lead, cadmium, and copper. These three elements have long-range transport characteristics and each has a demonstrated toxicity.

Significant Long-Term Transport Characteristics		No Significant Long-Term Transport Characteristics	
Element	Enrichment Factor	Element	Enrichment Factor
Lead	95	Calcium	0.5
Copper	76	Titanium	0.6
Cadmium	1850		

An enrichment factor of 95 for lead means that the lead detected in our atmospheric samples was 95 times higher than we would have expected if we were merely sampling resuspended materials from general crustal sources (i.e., soils, etc.). This indicates that the source of the lead is outside the park and potentially anthropogenic in nature. The same can be said for the copper and cadmium

*Work supported by Water Resources Field Support Laboratory, National Park Service, Dr. Raymond Herrmann, Director.

levels. As a comparison, calcium and titanium, two compounds not known to have a long-range transport characteristic, have enrichment factors of 0.5 and 0.6. What the effect of these elevated levels of trace elements is on remote ecosystems is a subject of concern for us. Hopefully it will be a subject of continuing research programs on the effects of low levels of pollutants in these remote areas.

This work has lead me directly to working with Soviet scientists beginning in 1978. Recently I headed a five person U.S. delegation to the Soviet Union to work with them on three of their reserves. We had two objectives: (1) to observe their ecological monitoring activities; and (2) to observe their pollution monitoring activities. The three reserves that we worked on were the Voronezh Reserve, the Priokso-Terrasny Reserve, and the Caucasus Reserve. During the entire trip, our Soviet colleagues were most accommodating and helpful.

The Soviet ecological research that we observed on this trip tended to be classically oriented and emphasized observations, whereas in the U.S. much of our ecosystem work today is more systematic and deals with processes. In the pollution monitoring area, from what we observed, I am convinced that the Soviets can produce data that is comparable with ours and reliable. However, we must establish a workable joint quality assurance program. Therefore, I feel that a meaningful joint program on paired, ecologically similar reserves, one or two in the U.S. and one or two in the Soviet Union, can be carried out. This program would entail a coordinated research program for monitoring selected ecological parameters and monitoring levels of pollutants.

I also feel that this work is a significant contributing step to the successful implementation of a global background monitoring network based around the biosphere reserves. This global network has been discussed in many international workshops and meetings. Currently a three station pilot network is proposed to be jointly supported by UNESCO MAB and UNEP GEMS. This three station network will involve a biosphere reserve in the U.S., a biosphere reserve in the Soviet Union, and a biosphere reserve in a less developed country, probably Chile. I believe that the U.S./U.S.S.R. work has significantly contributed to this project and eventually to the establishment of a true global network for background monitoring based upon the reserve system.

RESUME

G. Bruce Wiersma
Manager, Earth and Life Sciences

Education

1968	Ph.D. in Ecology, SUNY College of Environmental Science and Forestry, Syracuse University.
1965	M.F. in Forest Ecology, Yale University
1964	B.S. in Wildlife Ecology, University of Maine

Professional Experience

1980-Present	Manager of Earth and Life Sciences Division. The Division provides technical environmental, geoscience and biological support to all phases of the Idaho National Engineering Laboratory (INEL) programs through formal and informal reviews, advice and research on both nuclear and nonnuclear related programs.
1970-1980	U.S. Environmental Protection Agency, Las Vegas, Nevada/ Washington, D.C. Provided technical and administrative direction to research programs concerned with movement and transformation of pollutants in environmental systems.
1968-1970	U.S. Army Institute of Land Combat. Combat Developments Staff Officer responsible for conducting study on future defoliant systems and evaluating their possible ecological impact.

Selected Professional Activities

Editor, Environmental Monitoring and Assessment, an International Journal.

Head, U.S. Delegation to Soviet Union - Monitoring on Biosphere Reserves, October 1982.

Invited expert, World Meteorological Organization, Executive Committee Expert Panel on Pollution, April 1980.

Consultant, 2nd Interagency Meeting on Integrated Monitoring, Global Environmental Monitoring, UNEP, Nairobi, Kenya, January 1980.

Consultant, 1st Interagency Meeting on Integrated Monitoring, UNESCO MAB and UNEP, Geneva, Switzerland, September 1979.

Visiting Research Fellow, University of London, 1978-79.

Member of US-USSR Bilateral Negotiating Team on Biosphere Reserves, 1978-present.

Workshop on Biosphere Reserve Monitoring, UNESCO MAB Program, 1978.

Publications

Selected papers authored or coauthored by Dr. Wiersma on biosphere reserve monitoring:

Wiersma, G. B. 1981. Integrated Pollutant Monitoring at Olympic National Park, A U.S. Biosphere Reserve. Proceedings at the Second International Symposium on Integrated Global Monitoring of Environmental Pollution. Tbilisi, USSR. Oct. 1981.

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Davidson, C. I., W. D. Goold and G. B. Wiersma. 1982. Dry Deposition of Trace Elements in Olympic National Park. Presented at the Fourth International Conference on Precipitation Scavenging, Dry Deposition, and Resuspension, Santa Monica, California, Nov. 29-Dec. 3, 1982.

Brown, K. W., G. B. Wiersma, C. W. Frank. 1981. A Battery Operated Air Sampler for Remote Areas. Journal of Environmental Quality 10(1): 52-53.

Brown, K. W. and G. B. Wiersma. 1979. Pollutant Monitoring in Olympic National Park Biosphere Reserve. Second Conference on Scientific Research in the National Parks. Nov. 26-30, 1979. San Francisco, CA.

Morgan, G. B., G. B. Wiersma and D. S. Barth. Monitoring on Biosphere Reserves for Regional Background Levels of Pollutants. May 5-6, 1976. Presented at the US-USSR Symposium on Biosphere Reserves, Moscow, USSR.

An additional 38 papers in the area of environmental monitoring and assessment.

Mr. MACKAY. I would like to ask both Dr. Clark and Dr. Gregg—these are not editorial questions—what has been the level of financial support for the MAB program in your agency, and how does that manifest itself in terms of contributed time, dollars and so forth?

Dr. CLARK. Our contributions in the Forest Service have ranged from I think about $360,000 divided this way: As much as $300,000 in a particular year for the consortium where several agencies put funds in and then we, through a peer process, solicited proposals for studies that would support our mission.

In addition to that $300,000, we have also supported the actual administration of the MAB secretariat at the level of $60,000 a year in several years. There has been some variance in that. Those were the best years. We have also provided some years full-time, some years part-time, half-time scientist support for the secretariat.

Last year I think our level dropped to about $140,000 total for the consortium and support for the secretariat.

Mr. MACKAY. Dr. Gregg?

Mr. GREGG. We, as well, have had quite some variation in terms of the level of funding support of MAB and staff support of MAB.

I suppose it depends on how one wishes to look at support. If you are looking at direct financial support to the MAB secretariat and the MAB consortium, we, as well, within the Department of Interior, reached a peak in 1980 at $300,000, I believe, was our level. It is a little bit lower than the Forest Service.

That has declined in recent years due to budgetary constraints. I think, though, support from MAB needs to be looked at in the broader context.

We have utilized MAB with some funding support to provide a catalytic service to us to enable us to do some things, such as the genetic resources management symposium that I referred to last year, which would simply not have been possible otherwise. MAB allows us to network institutional support from a variety of governmental and particularly nongovernmental and private sources, which would be much more difficult, if not impossible, for us to do otherwise.

So we do fund on a project-by-project basis those kinds of things which we feel would—where we don't have sufficient money to carry it out completely ourselves and where the aegis of MAB helps us to network the support we need.

In terms of support in the field, I think if one looks at the biosphere reserves' science budgets, they clearly in the main receive the most generous support of any of the units of the national park system. I think it is difficult to impute a cause and effect relationship here between biosphere reserve status and funding, but I think clearly the biosphere reserve status elevates the importance of these areas in terms of their multiple conservation missions, as well as for research.

I think it has had an effect, an increasing effect. Such as, for example, I mentioned in the Virgin Islands, of increasing within-agency support for science in these important areas.

As far as staff support is concerned, one of my principal responsibilities is to coordinate MAB activities within the national park system, and that consumes a good bit of my time.

We also have from time to time detailed people to the secretariat. A recent detail to administer a contract with the Agency for International Development to prepare environmental profiles of a number of countries is a notable example, where we actually had an individual over at the secretariat working with the secretariat on this project, and while he was there, of course, he provided a lot of other miscellaneous services to the secretariat.

So I think that the monetary support, perhaps, appears small, but when you look at the number of individuals and the level of voluntarism 13,000 hours, for example, in 1 year of volunteer research assistant service in Great Smoky Mountains National Park—I think it is quite obvious that MAB and biosphere reserve status does, in some way, serve as quite a catalyst for generating support for scientific work.

Mr. MACKAY. I guess from the standpoint of this committee, the real question would be if the other funding drops off, then of necessity, since your agencies are also accountable for your programs, it is going to impact the man and the biosphere program because it is only going to be funded by the agency to the extent it is within the area of interest and concern of your agencies, which is another point, I guess.

Another way to put that would be if we didn't have MAB, you would probably be doing the same thing anyway. It just helps you to do it more effectively.

Dr. CLARK. Absolutely correct.

Mr. MACKAY. So, I mean the whole purpose for it is not really being served. That purpose, I would gather, Dr. Baker, is to have

independent people with a broad view deciding what study needs to be done.

Mr. BAKER. I agree.

That is what we are going to lose if it ceases to have an independent funding source. I am just trying to get this straight just exactly, to pin down what is the issue involved. It is not the $60,000 or the $1 million. It is really the question of how the program is going to function.

Dr. Gregg?

Mr. GREGG. I would add from a purely parochial perspective of biosphere reserve establishment. We are hoping to establish an additional few areas this year at Apalachicola Bay. The Apalachicola River Basin is one of them in your area, and I would say that the withdrawal of funding support for MAB would probably result in the dissolution of MAB institutions, which would bring the biosphere reserve, the further establishment of these valuable areas to a virtual halt.

We would have no vehicle for handling that important function. So I think that just from our perspective in that project, it would be most unfortunate.

Mr. MACKAY. Any comment to that, Dr. Clark?

Dr. CLARK. I think you stated it very well. Actually, we have our missions and regular programs. MAB helps us to do some things a lot better. It expands our vision. It expands the area of expertise that we are able to call on and we get a lot of contributed help there, too.

Mr. MACKAY. Thank you. That has been very helpful. Dr. Wiersma, actually your project is one that originated within MAB. So it is more of an example of the kind of project that might not have ever come about if you did not have this coordinated overview.

Mr. WIERSMA. That is right, Mr. Chairman. Particularly the aspect now, that it looks like MAB would be very effective in coordinating a global network, integrating the work that we are doing in the United States, funded by the National Park Service, the Soviet work which is funded by them, and the good will work funded by someone else.

Mr. MACKAY. That is really interesting. That is probably the next generation of what we need to preserve besides genetic material, and that is baseline data on what it used to be like.

Mr. WIERSMA. Yes, and we are a little late right now.

Mr. MACKAY. Yes. Do you have any further comments that you would care to make for the record. This has been very helpful to me and I appreciate it very much.

Dr. CLARK. Appreciate the opportunity.

Mr. WIERSMA. Yes, sir. Thank you for the opportunity.

Mr. MACKAY. Our final panel is Mr. Bruce Rich of the Natural Resources Defense Council and Ms. Barbara Bramble of the National Wildlife Federation.

I would appreciate any summary that you would care to make and we will file your written testimony with the committee record.

I am sorry this has taken so long. You could imagine what it would be like if there were six of us up here. It is a fascinating subject to me and in many ways an example of what can happen to

a very cost effective, very important program that lacks a point of advocacy within this system. Mr. Rich.

STATEMENTS OF BRUCE RICH, NATURAL RESOURCES DEFENSE COUNCIL AND BARBARA BRAMBLE, NATIONAL WILDLIFE FEDERATION

Mr. RICH. I appreciate greatly the opportunity to testify before the subcommittee concerning the U.S. man and the biosphere program.

I am Bruce Rich, an attorney with the international program of the Natural Resources Defense Council. I am testifying this afternoon on behalf of NRDC and four other national environmental organizations: The World Wildlife Fund, U.S.; Friends of the Earth, the Sierra Club and the Izaak Walton League of America.

Together these organizations have some 550,000 members and supporters nationwide. These environmental organizations wish to express their strong endorsement of the U.S. MAB program and their concern that diminishing U.S. support over the past 3 years now threatens the program's very existence.

In the remainder of my testimony this afternoon, I will briefly take a look at the nature of the MAB program, the role of the U.S. MAB program and its cost effectiveness, and then I will conclude.

The Earth's natural resources and life-supporting biological systems are undergoing increasingly severe pressures from growing populations, expanding resource consumption and rising pollution.

These problems are becoming especially acute in the Third World where the productivity of soils is being destroyed, tropical forests are being cleared and decertification of formerly habitable areas is occurring in many regions.

The direct consequence of this ongoing destruction in many areas of the world is massive emigration, often to North America, and social and political instability.

When we read of the cost of U.S. assistance to El Salvador or the expense of dealing with illegal refugees from Haiti, we should remember that these are the two most eroded and deforested countries in the Western Hemisphere.

These are nations that are losing the ecological capacity to adequately sustain their populations. Global ecological insecurity is a threat to global and U.S. economic and political security.

What is needed, among other things, are cost effective, international, interdisciplinary activities that link scientific research to planning and policymaking to address these problems.

The best example of such a program is the UNESCO MAB program. A number of recent U.S. Government studies have reiterated the need for increased support for MAB and similar programs.

These studies are listed at the bottom of page 3 in my prepared testimony. In its short lifetime, the U.S. MAB program has initiated activities which have directly furthered a number of long-term U.S. interests, which we have heard about today.

I will just mention five of these areas of interest. We have heard today how new channels for U.S. bilateral scientific cooperation

with a number of countries have been created by the MAB program.

These countries include Canada, Mexico, and the U.S.S.R. Also, MAB has been a very useful and flexible means for coordinating and getting together the scientific and managerial skills to help the U.S. Agency for International Development perform its environmental mandate.

Over the past few years, a Foreign Assistance Act has been amended with a new section 118, which directs the U.S. Agency for International Development to devote more of its resources to environment and natural resource related problems in developing countries.

We heard how a 1977 contract with U.S. AID enabled MAB to prepare environmental profiles of 47 countries where U.S. AID is active, and how MAB organized for AID a number of training courses in environmental management and has conducted studies concerning the environmental impacts of AID's development projects.

Other witnesses this afternoon have shown how MAB is an exceptionally flexible mechanism for promoting regional communication and cooperation in areas of strategic importance for the United States, such as the Caribbean.

In addition, U.S. MAB has an arctic regional directorate which is undertaking joint regional research activities with Canada, the U.S.S.R., and the Scandanavian countries as part of a MAB-initiated northern science network.

U.S. MAB has been particularly active in addressing one of the world's most critical natural resource problems, the ongoing destruction of the Earth's remaining tropical forests. The Congress has already expressed its concern with this problem by holding two separate hearings on tropical deforestation and amending, section 118 of the Foreign Assistance Act to direct the President to consider the recommendations of the Interagency Task Force on Tropical Forests.

Prominent among the recommendations of this task force is that the United States support the United States MAB program, particularly, in helping to expand the international system of biosphere reserves to cover representative tropical forest ecosystems.

This task force also recommended that the United States determine how the MAB program can be applied still more effectively in the tropical forest area. Until funding disappeared this year for MAB research projects, about one-third of MAB projects had been concerned with understanding and sustaining tropical forest ecosystems.

Last, and a closely related area of concern, is the endangered biological diversity of the Earth. The U.S. State Department and Agency for International Development and a number of other agencies sponsored in 1981 a strategy conference on biological diversity where it was pointed out that by the year 2000, up to 20 percent of the species now in existence may become extinct, mainly through destruction of habitat areas all over the world.

We have heard today, too, how one of the most outstanding, noteworthy accomplishments of MAB internationally has been the establishment of a global network of more than 215 biosphere re-

serves, which have just this goal, to conserve natural areas and the genetic diversity which they contain.

Now, the United States is undertaking bilateral research and monitoring projects concerning biosphere reserves, not only with the U.S.S.R., Mexico, and Canada, but also with Costa Rica, Brazil, and India.

Now, MAB is one of the least expensive, most flexible, least bureaucratic, most cost effective of all international programs that we have supported. In the beginning of the eighties, there were nearly a thousand MAB field projects in over 77 countries. Yet MAB's central secretariat in Paris has an annual budget of only around a million dollars and a staff of just 10.

Continued participation of the United States in MAB allows scientists and policymakers in this country to tap into an enormous wealth of practical information concerning all aspects of natural resource management.

The U.S program itself has funded 37 research projects, numerous workshops and symposia, promoted U.S. bilateral and regional relations, assisted U.S. AID in carrying out its environmental mandate, set aside 38 biosphere reserves, and accomplished all this mainly in the last 4 years on budgets which have averaged out to a few hundred thousand dollars annually.

We have also heard this afternoon how the U.S. MAB program is extraordinarily cost effective. This is mainly due to its very nature in stimulating and promoting activities which receive support from other sources, both monetary support and voluntary services.

The 14 U.S. MAB directorates rely on the voluntary services of up to 200 of the Nation's leading resource scientists and experts. Many of the symposia and conferences in which the United States has participated have received substantial or the main portions of their funding from the MAB programs of other nations and from international agencies, such as UNEP, UNDP, and the Caribbean Development Bank.

Some of the MAB directorates in the United States, such as the arctic regional directorate, have been successful in obtaining more funding from independent sources than from the U.S. MAB program itself.

Finally, we have heard how MAB is an effective way for a number of U.S. Government agencies to undertake cost effective, cooperative approaches to solving problems they wouldn't have the resources to approach alone.

In conclusion, I would like to mention that the U.S. MAB program has never really been given the full financial support and commitment it so clearly merits. Besides coping with steadily decreasing funding levels since its second year of cooperation in 1980, it has been hampered in the past by a lack of secure funding authorization and appropriations from contributing agencies.

Each year the program has had to await indeterminate contributions from participating agencies with little indication of the amount or even continued existence of funding.

This year the MAB program has been virtually paralyzed with no funding forthcoming for new research projects. After such a promising start, the program risks being terminated at a time when many other nations, especially developing ones, are becoming

increasingly aware of the need for greater international cooperation in dealing with natural resource management problems.

MAB has already shown that it has effectively acted in a number of areas of concern to the Congress. Environmental organizations on behalf of whom I am testifying urge the Congress to take measures to restore and insure a steady and dependable level of financial and institutional support so that U.S. MAB can continue its important work.

While a new institutional home is being sought for MAB, interim measures should include a specific line item commitment in the appropriate State Department authorization legislation.

That concludes my statement. Thank you very much.

[The prepared statement of Mr. Rich follows:]

Statement of

World Wildlife Fund - U.S.
Sierra Club
Friends of the Earth
Izaak Walton League of America
Natural Resources Defense Council, Inc.

Before the

Subcommittee on Natural Resources,
Agricultural Research and Environment
Committee on Science and Technology
United States House of Representatives
Washington, D.C.

April 5, 1983

Submitted by:

Bruce M. Rich
Natural Resources Defense
Council, Inc.

I. Introduction

Mr. Chairman, I appreciate the opportunity to testify before this Subcommittee concerning the U.S. Man and the Biosphere Program ("MAB"). I am Bruce M. Rich, an attorney with the International Program at the Natural Resources Defense Council, Inc. I am testifying on behalf of five environemntal organizations: the Natural Resources Defense Council, Inc., the U.S. Appeal of the World Wildlife Fund, Friends of the Earth - U.S., the Sierra Club, and the Izaak Walton League of America. Together, these organizations have some 550,000 members and supporters in the United States. The Sierra Club has 350,000 members nation-wide and for many years has had a representative on the U.S. National Committee for MAB. The U.S. Appeal of the World Wildlife Fund has 85,000 members and the Friends of the Earth 35,000. Both NRDC and the Izaak Walton League are also represented on the U.S. National Committee for MAB. NRDC has 35,000 members and the Izaak Walton League 45,000.

These environmental organizations wish to express their strong endorsement of the U.S. MAB Program and concern that diminishing U.S. support over the past three years now threatens the program's very existence.

II. Background

Developing and promoting scientifically based, institutionally viable techniques and policies to manage the earth's natural resources is one of the key challenges of our time. The U.S. is increasingly interdependent politically and economically with the rest of the globe. The most rapid growth

of reciprocal linkages is occurring with the Third World. It is becoming increasingly apparent that long term U.S. security and well being is inextricably linked to the sustainable management of its own natural resource underpinnings and those of other nations.

At the same time, the earth's natural resources and life-supporting biological systems are undergoing increasingly severe pressures from growing populations, expanding resource consumption, and rising pollution. These problems are becoming especially acute in the Third World, where essential ecological processes and relationships are being drastically undermined. Increasingly large numbers of species of animals and plants are being extinguished along with their habitats. The productivity of soils is being destroyed and watersheds are being denuded of their cover, causing increased flooding and siltating. Tropical forests are being cleared to produce beef or crops for only a few years on unsuitable soils, and indigenous peoples are being displaced. Desertification of formerly habitable areas is occurring in many regions.

A direct consequence of this ongoing destruction of the carrying capacity of ecosystems in much of the world is massive emigration, often to North America, and social and political instability. When we read of the cost of U.S. assistance to El Salvador or of the expense of dealing with illegal refugees from Haiti, we should also remember that these are the two most eroded and deforested countries in the Western Hemisphere. These nations have lost the ecological capacity to adequately sustain

their populations. Clearly, as a representative of the World Bank recently pointed out,1/ global ecological insecurity is a threat to global - and U.S. - economic and national security.

The challenge posed by the increasing seriousness of the global resource management crisis can be met by cost effective international, interdisciplinary activities which link basic and applied scientific research to planning and policy making. At least one such undertaking already exists: the UNESCO Man and the Biosphere Program. A number of recent U.S. Government Studies have reiterated the need for increased support for MAB and similar programs.2/

III. Nature of MAB

The UNESCO Man and the Biosphere Program was established in 1970 with the goal of finding through international, interdisciplinary research practical solutions to management problems of natural resources and land development. MAB activities are divided into 14 "projects' which are being

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1/ Dr. James Lee, Environmental Security and Sustainable Development -- No Longer A Choice, World Bank, 1982.

2/ These studies include the following:

Technologies to Sustain Tropical Forest Resources, U.S. Congress Office of Technology Assessment, 1983 (forthcoming); Proceedings of the U.S. Strategy Conference on Biological Diversity, U.S. Department of State, 1981; Global Future: Time to Act, U.S. Council on Environmental Quality and Department of State, 1981; The World's Tropical Forests: A Policy, Strategy and Program for the United States, Report to the President by a U.S. Interagency Task Force on Tropical Forests, 1980; The Global 2000 Report to the President, U.S. Council on Environmental Quality and Department of State, 1980; and Proceedings of U.S. Strategy Conference on Tropical Deforestation, U.S. Department of State, 1978.

implemented in over 1000 field projects by 77 of the more than 100 countries that have formed national MAB committees. MAB field projects usually combine pure and applied research, and demonstration, training and educational activities.

MAB Projects 1 through 7 focus on specific geographical areas: tropical forests, temperate forests, grazing lands, acid zones, fresh water systems and coastal zones, mountains, and islands. Project 8 is concerned with the establishment of a global network of "Biosphere Reserves" which are protected areas representative of the earth's major ecosystems. The establishment of biosphere reserves is essential for preserving the earth's genetic diversity and to provide living laboratories for environmental baseline monitoring and ecological research. MAB Projects 9 through 14 are concerned with specific human activities which affect natural resources and the environment. These are pesticides and fertilizers, urban ecosystems, demographic change, perception of environmental quality, and pollution.

MAB activities are overseen globally by a small 10 person International Secretariat at UNESCO headquarters in Paris and by an International Coordinating Council (ICC). The ICC consists of representatives from U.N. organizations and from the national committees, which are made up of scientists and representatives of governmental and nongovernmental organizations. The U.S. occupies one of the four Vice-Presidencies of the ICC. The national secretariats administer and seek funds for the national MAB programs, which are more or less autonomously developed to

harmonize with national and international priorities.

MAB is focusing research carried out in its 14 projects on four major priorities: problems of humid tropical zones; problems of arid, semi-arid marginal lands; problems of urban systems; and conservation as a component of sustainable economic development. These priorities correspond to the most pressing natural resource management crises which must be resolved if economic and social stability for most of the earth's population is to be attained.

The following characteristics are some of the reasons why MAB is an especially noteworthy and outstanding international program;

1. It is an evolving and highly flexible program. Successful trends are promoted and ineffective components are eliminated. In the past 10 years the emphasis of the 14 project areas has concentrated on the four priority areas mentioned above and has become increasingly responsive to local social and cultural conditions.

2. MAB's orientation is eminently practical - to produce research results in a form helpful to decisionmakers. An important aspect of MAB is sytematic dissemination of knowledge through publications, conferences and workshops involving representatives from countries with similar ecological problems.

3. One of the most universially recognized constraints to effective national and international response to ecological crises is lack of coordination and cooperation on various levels:

a. between nations;

b. between different government departments, and between governments as a whole and the nongovernmental and academic sectors;

c. between different academic disciplines in the natural and social sciences. The international, inter-sectorial, inter-disciplinary nature of MAB provides an outstanding example of a voluntary program which is attempting to bridge these gaps. It can serve as a model for how similar efforts involving global coordination and cooperation might be taken in other fields.

Other aspects of the MAB program are discussed in the following sections on the U.S. Role and on Cost Effectiveness.

IV. Organization of U.S. MAB Program

The U.S. MAB Program has consisted of a small Secretariat, located with the Secretariat of the U.S. National Commission for UNESCO, 14 Directorates corresponding to MAB Project areas, the U.S. National Committee for MAB, and a funding consortium for financing individual research projects. The Directorates consist of U.S. scientists and experts who volunteer their time and skills to develop and implement reserach projects and other MAB activities in their respective specialties. The U.S. National Committee for MAB has members drawn from academic, private and public sector organizations, including three of the environmental organizations on behalf of whom I am testifying today: the Natural Resources Defense Council, Inc., the Sierra Club and the Izaak Walton League of America. The MAB Consortium has been the mechanism through which funding has been channeled for 37 research projects undertaken to date. Funding for the MAB

Secretariat and for the projects of the Consortium has come principally from the Department of State, National Parks Service and U.S. Forest Service. Financial support for U.S. MAB activities has mostly been indeterminate and at the discretion of the funding agencies. Funding of MAB research projects has been declining at a geometric rate: 16 projects were supported in 1980, 9 in 1981, 4 last year, and none so far this year. Proposed budget slashes for the U.S. National Commission for UNESCO for FY 1984 mean that the U.S. MAB Secretariat will cease functioning if alternative funding is not found.

V. The U.S. Role

In its short lifetime the U.S. MAB Program has initiated activities which directly further long term U.S. interests in ways which MAB is exceptionally well suited to promote, namely through voluntary association of U.S. and foreign scientists and government officials in research and workshops concerning politically neutral ecological issues of common concern. In particular, MAB's role has been significant in opening up new channels of bilateral communication with Mexico, the USSR and Canada. MAB has been a very useful institution for implementing programs which further the legally mandated goals of U.S. AID and for promoting strategies to deal with resource crises in geographical areas of critical strategic interest such as the Caribbean. Finally MAB has been - and should continue to be - a program which is particularly well suited for coordinating U.S. strategies to deal with the problems posed by tropical deforestation and the ongoing destruction of the earth's

biological diversity. Both of these issues have been the subject of strategy conferences held by the Department of State and U.S AID, and, in the case of tropical deforestation, of the creation of an Interagency Task Force, amendments to the Foreign Assistance Act, Congressional hearings and an ongoing study by the Office of Technology Assessment. I shall examine these points seriatum:

A. Bilateral Relations

New channels for U.S. bilateral scientific cooperation with Mexico have been created by the MAB program, including exchange of data and joint research in continguous biosphere reserves, and a number of cooperative research projects between scientists in the U.S. Directorates and their Mexican colleagues. Bilateral projects and symposia have included, for example, a U.S.-Mexico Workshop on "Social Implications of Environmental Problems," a bilateral program of Comparative Studies of Dry Forests in Western North America, and a bilateral seminar on "Social and Environmental Consequences of Natural Resources Policies." The U.S. exchanges data and coordinates research with Canada in contiguous biosphere reserves and is joined with Canada, the USSR and the Scandinavian countries in a MAB promoted "Network of Cooperation in Northern Science."

The USSR and the U.S. have a joint MAB program for coordinated environmental monitoring in their Biosphere Reserves. Two U.S.-USSR Symposia on Biosphere Reserves have been held and a U.S. scientific team has visited Reserves in the Soviet Union. Given the importance and precariousness of U.S.-

Soviet relations, the continued existence of politically neutral exchange mechanisms such as MAB has an importance that goes beyond simple exchange of scientific information.

B. U.S. AID

In recent years AID has received a legal mandate through amendments to the Foreign Assistance Act (Section 118) to devote more of its resources to environment and natural resource related problems in developing countries. MAB has been a useful and flexible means for coordinating the scientific and managerial skills for a number of AID activities, and can continue to serve this function in the future. Under a 1977 Resources Support Services Agreement (RSSA) with AID the U.S. MAB program prepared Environmental Profiles of 47 countries, organized several training courses in environmental management, and elaborated four studies concerning environmental evaluation of different kinds of development activities.

C. Regional Activities

MAB has already shown that it is an exceptionally flexible mechanism for promoting regional communication and cooperation in areas of strategic importance for the U.S. U.S. MAB has a separate "Caribbean Islands Directorate" (MAB 7B) which has been instrumental in the creation of a "Caribbean Institute for Resource Management" in Puerto Rico. In partnership with the OAS, IMCO and UNEP it has promoted and designed an oil spill contingency plan for the Csaribbean region. In 1979 U.S. MAB sponsored a "Conference on Environmental Management and Economic Growth in the Smaller Caribbean Islands" which brought together

for the first time delegates from island nations in the region and representatives of development assistance agencies to discuss and promote ways of achieving sustainable economic growth.

U.S. MAB also has an Arctic Regional Directorate (MAB 6-b) which, as mentioned above, is undertaking joint regional research activities with Canada, the USSR, and the Scandinavian countries as part ofthe UNESCO "Northern Science Network" initiative.

D. Tropical Deforestation

U.S. MAB has been particularly active in addressing one of the world's most critical natural resource problems - the ongoing destruction of the earth's remaining tropical forests. The Congress has already expressed its concern with this problem by holding two separate hearings on Tropical Deforestation and through recent amendments to Section 118 of the Foreign Assistance Act which direct the President to consider the recommendations of the Interagency Task Force on Tropical Forests. The Task Force Report found that:

> "The consequences of uncontrolled tropical forest losses are myriad and serious. They include rising prices and wood shortages in tropical countries, as well as a diversity of ecological problems. Floods of unprecedented severity, with large life and property losses, have been reported recently by Asian nations, and attributed largely tothe loss of vegetation on upland watersheds. Lakes, reservoirs, and irrigation systems are adversely affected by siltation. In the semiarid regions of Africa and Asia, where up to 90 percent of the population depend on woody vegetation for fuel, fuelwood supplies are receding far from human settlements. Fuelwood prices, wood collection time, and the suffering from doing with less continue to increase. With no other substitutes available, people are burning dung and crop residues which previously were used to

> maintain soil fertility. The process of "desertification," triggered by vegetative cover removal and overgrazing in semiarid regions, now threatens the productive capacity of the resource base over large areas of the Tropics.
>
> Consequences of forest loss also include the extinction of indigenous plant and animal species which is occurring at a rate never before experienced. According to a forthcoming National Academy of Sciences report, fully one-third of all tropical organisms - almost a million species - may become extinct by the end of the century as a result of deforestation. As an additional source of concern, recent investigations of the carbon cycle have suggested that continuing tropical forest losses on the current scale may contribute to destabilization of the Earth's climate in the 21st century. Report to the President by a U.S. Inter-Agency Task Force on Tropical Forests, p. 2.

Prominent among the recommendations of the Task Force is that the U.S. "Support the U.S. MAB Program, within the context of the overall UNESCO Strategy, particularly to help expand the international system of biosphere reserves to cover representative tropical forest ecosystems..." Report to the President by a U.S. Interagency Task Force on Tropical Forests, p. 47. The Task Force also commended that the U.S. "Determine how the integrated resource management approach and capabilities of the U.S. Man and Biosphere (MAB) Program can be applied more effectively in the tropical forest area." Id., p. 44.

About one-third of MAB consortium research projects have been concerned with understanding and sustaining tropical forest ecosystems. MAB projects in this area have included, for example, much needed studies of agro-forestry techniques and ways of minimizing soil nutrient loss in tropical forestry. This

information is playing an important role in helping developing countries avoid mistakes in land use, which have resulted in cleared forest lands becoming less productive within a short period or in complete abandonment of these lands.

E. Biological Diversity

At the U.S. Strategy Conference on Biological Diversity it was noted that "it is estimated that by the year 2000 upwards of a million additional species - about 20% of those now in existence - may become extinct. Yet on this threatened biological diversity depends, in significant degree, the fundamental support system for man and other living things." James L. Buckley, in Proceedings of the U.S. Strategy Conference on Biological Diversity, p. 9. A major recommendation of the Conference was that the U.S. cooperate more fully with international organizations such as MAB that are concerned with the maintenance of biological diversity.

One of the most outstanding and noteworthy accomplishments of MAB internationally and within the U.S. has been the establishment of a global network of more than 215 "Biosphere Reserves" as the major element of MAB Project 8: "Conservation of Natural Areas and of the Genetic Diversity They Contain." The Biosphere Reserves concept involves setting aside representative samples of all of the earth's major ecosystems. Each reserve contains an untouched core area surrounded by a semiprotected area where the effects of human modification of the ecosystem can be studied. To date, 37 biosphere reserves have been set aside in the U.S. in 17 of the nation's 20 major ecological regions.

The U.S. is undertaking bilateral reserach and monitoring projects conerning Biosphere Reserves with the USSR, Mexico, Costa Rica, Brazil and India.

The U.S. Reserves are internationally recognized sites for specific conservation and research and often correspond to existing National Parks or Experimental Forests. Because of their relatively pristine condition, they provide invaluable biological baselines for global environmental monitoring, including the study of the effects of acid rain and other pollution. This monitoring is contributing to our understanding of the long-range transportation of pollutants and their impacts - which is essential for developing effective national and international controls.

VI. Cost Effectiveness of MAB

MAB is one of the least expensive, most flexible, least bureaucratic and most cost effective of all international programs. In the beginning of the 1980s, there were nearly 1000 MAB field projects in over 77 countries. Yet MAB's Central Secretariat in Paris has an annual budget of around only one million dollars and a staff of ten. Continued participation of the U.S. in MAB allows scientists and policy makers in this country to tap into an enormous wealth of practical information concerning all aspects of natural resource management.

The U.S. Program itself has funded 37 research projects, numerous workshops and symposia, promoted U.S. bilateral and regional relations, assisted U.S. AID in carrying out its environmental mandate, set aside 37 Biosphere Reserves - all in

four years on budgets which have averaged out to a few hundred thousand dollars annually.

The U.S. MAB program is extraordinarly cost effective since its very nature is to stimulate and promote activities which receive support from other sources - both monetary support and voluntary services. The U.S. MAB Directorates rely on the voluntary services of up to 200 of the nation's leading resources scientists and experts. Many MAB symposia and conferences in which the U.S. has participated have received substantial portions of their funding from the MAB programs of other countries and from international agencies such as UNEP, UNDP and the Caribbean Development Bank. Some of the MAB Directorates such as the Arctic Regional Directorate have been successful in obtaining more funding from independent sources than from the U.S. MAB program itself. Finally, MAB is a way for a number of U.S. Government agencies to undertake cost effective cooperative approaches to solving problems they would not have the resources to approach alone.

VII. Conclusion

The U.S. MAB Program has never been given the financial support and commitment it so clearly merits. Besides coping with steadily decreasing funding levels since its second year of operation in 1980, it has been hampered in the past by a lack of secure funding authorization and appropriations from contributing agencies. Each year the program has had to await indeterminate contributions from participating government agencies, with little indication of the amount or even continued existence of

funding. This situation has severely constrained planning and implementation of longer term research activities.

In light of these formidable financial and administrative constraints, MAB's record of usefulness to the U.S. government and scientific community in the last four years is impressive.

This year the MAB program has been virtually paralyzed, with no funding forthcoming for new research projects. The continued existence of the U.S. MAB Secretariat is threatened in FY 1984. After a promising start, the program is being prematurely terminated at a time when many other nations, especially developing ones, are becoming increasingly aware of the need for greater international cooperation in dealing with natural resource management problems.

Ending U.S. involvement in MAB would be a waste of the considerable intellectual, organizational, and financial investment which the government and participating organizations and institutions have made to make U.S MAB into a model international program in terms of flexibility and cost effectivenss. MAB has already shown that it has effectively acted in a number of areas of concern to the Congress: establishing new, flexible channels for U.S. bilateral and regional relations, assisting U.S. AID in its environmental mandate, and addressing key natural resource problems affecting long term global stability such as tropical deforestation and loss of genetic diversity.

The environmental organizations on behalf of whom I am testifying urge the Congress to take measures to restore and ensure a steady and dependable level of financial and institutional support so that U.S. MAB can continue its important work. Such measures should include specific line item commitments in the appropriate State Department, National Parks Service and Forest Service authorization legislation.

I appreciate the opportunity to submit this statement and would be pleased to submit any additional information you might require.

Mr. MACKAY. Ms. Bramble.

Ms. BRAMBLE. Thank you, Mr. Chairman. My name is Barbara Bramble and I am Director of the International Programs of the National Wildlife Federation.

I am pleased to have the opportunity to speak to you today to add one more voice in support of the U.S. man and the biosphere program.

The National Wildlife Federation is one of the world's largest private conservation organizations with 4.2 million members and supporters. The Federation is dedicated to the wise use, conservation, and restoration of natural resources and has long understood the inseparable connection between economic development and the conservation of natural resources.

Because MAB is dedicated to these same principles, the Federation has consistently supported this farsighted program. I would mention here that our former executive vice president, Tom Kimball, was a member of the U.S. committee for MAB for many years.

The National Wildlife Federation has a large constituency of hunters, fishermen, and other conservationists. These are people who understand one of the most important principles of the wise use of natural resources, which is that economic development of both poor and rich nations depends on the sustained yield of ecological systems, soil, water, forests, and wetlands.

Our members also realize that to wisely manage and conserve our natural heritage, we need a much greater understanding of how it works. We particularly need to concentrate on how man and his activities affect the Earth and vice versa.

These are just the questions which the man and the biosphere program is designed to address. I would point out just a few of the project areas in which MAB has specialized to show the direct importance of these areas to all of us.

MAB projects are looking at the ecological effects of man's activities on tropical and temperate forests, savanas and grasslands, arid zones, wetlands, islands, and tundra ecosystems.

They are looking at the effect on man and his environment of pesticides and fertilizers, large engineering works, and environmental pollution. They are investigating the ecological aspect of urban systems.

They are, of course, best known for their project area 8, which is conservation of natural areas and genetic diversity, the biosphere reserves System.

The international MAB program has sparked the establishment of 215 biosphere reserves in 58 countries around the world. These serve as samples of varied ecosystems and reservoirs of genetic diversity and will be valuable for future scientific research.

They will also lead the way toward natural resources conservation on land outside the reserve boundary. The National Wildlife Federation is particularly interested in MAB studies of ways to maintain natural areas in developing countries.

It is clear that these reserves cannot survive unless they benefit the people that surround them. MAB projects are illustrating examples of integrated development schemes, which both improve the lives of Third World farmers, for example, and at the same time

permit conservation of ecologically important reserves, such as a forested watershed.

The U.S. participation in the international MAB program is voluntary, as it is for all nations. Our program has, in fact, been a good example for several years of how Government agencies can cooperate on important research work and bring forth major volunteer efforts on a small budget at the best of times.

The National Park Service, U.S. Forest Service, the Agency for International Development, and EPA have all at one time or another collaborated on projects of the U.S. MAB. The State Department has provided office space and personnel to coordinate the U.S. program out of funding for the UNESCO national committee, which is in State's budget.

Project funding, on the other hand, as we have heard today, has been provided as voluntary contributions from the research funds of the Park Service and the Forest Service and various private sources.

In no case has there been assured line item funding for MAB, and since 1980 funding has been completely inadequate. This means that the program, both in the coordinating secretariat, and for projects, is particularly vulnerable during times of tight budgets.

The National Wildlife Federation believes that the U.S. MAB program addresses some of the crucial questions facing the human race in the future: Sustainable economic development, sustained yield agriculture and forestry, explosive growth of cities, particularly in the Third World.

The United States should not allow funding for this important program to fall through the cracks in difficult economic times. The Federation feels strongly that both the MAB coordinating office and the project funds should be given line item funding, at least in part to make possible rational project planning.

We hope that if an appropriate opportunity arises, this subcommittee would make such a recommendation to the relevant authorization and appropriation committees.

I would add one more comment with reference to MAB funding, which has been mentioned here today, that as noted, the MAB program was started in 1971 as part of the UNESCO program.

At that time, that was the only U.N. agency which had any relevance to the ecological issues that MAB involved. Thus UNESCO was not then an unreasonable choice for housing MAB, although afterward the United Nations environment program was formed, and might be a more compatible home for the entire program.

But in any event, MAB is still part of UNESCO and a victim of the unhappy circumstance that UNESCO is very politicized internationally over issues entirely extraneous to MAB's concerns.

The federation hopes that MAB's value and scientific impact would be judged on their own merit and that the program would be viewed as separate from the political intricacies of the UNESCO system.

In summary, MAB is valuable in its own right. It is a vital program working for the future habitability of the Earth, and U.S. participation should be greatly increased over the years, and not decreased.

We feel that it deserves the full support of the United States. Thank you very much.

[The prepared statement of Ms. Bramble follows:]

Statement of Barbara J. Bramble
on Behalf of the National Wildlife Federation
Presented Before The
House Subcommittee on Natural Resources,
Agricultural Research and Environment,
of the Committee on Science and Technology

Good afternoon, Mr. Chairman. My name is Barbara Bramble, and I am Director of International Programs of the National Wildlife Federation. I am pleased to have the opportunity to speak to you and members of the subcommittee here today on behalf of the U.S. Man and the Biosphere Programme (MAB).

The National Wildlife Federation is one of the world's largest private conservation organizations with 4.2 million members and supporters. The Federation is dedicated to the wise use, conservation and restoration of natural resources, and has long understood the inseparable connection between economic development and the conservation of natural resources. Because MAB is dedicated to these same principles the Federation has consistently supported this farsighted program. (I have attached to my testimony, as an example of our long-held interest, an article about MAB which appeared in one of our publications, International Wildlife, in 1977.)

The National Wildlife Federation constituency of hunters, fisherman and other conservationists knows that animals and plants form interconnected ecosystems; that man is absolutely dependent on the continued functioning of those ecosystems; and that man's ability to profoundly disrupt these systems threatens future human survival.

Thus, our members understand one of the most important principles of the wise use of natural resources, which is that economic development of both poor and rich nations depends on the sustained yield of ecological systems -- soil, water, forests, wetlands. Our members also realize that to wisely manage and conserve our natural heritage, we need a much greater understanding of how it works; we particularly need to concentrate on how man and his activities affect the earth's life systems, and vice versa.

These are just the questions which the Man and the Biosphere Programme is designed to address. I do not wish to take your time here today to detail the structure of the MAB programme, because it is well covered by the comprehensive statement of Bruce Rich, who also appears today, on behalf of the Natural Resources Defense Council and other organizations. But a few remarks are in order to illustrate the value of the MAB programme for long-term natural resources conservation.

The importance of MAB projects: MAB supports basic research into the functions of ecosystems; some of the projects have been deliberately set up to compare two similar ecosystems, one perturbed by man, and one not. One project in the U.S. has been examining

alternative ways of managing a mountain watershed, which is one of the clearest illustrations of how a functioning natural system can benefit (or harm) downstream communities, depending on how well it is cared for.

A look at the major MAB project areas shows the central importance of the MAB programme to increasing our understanding of human interaction with our planet: MAB projects are looking at the ecological effects of man's activities on tropical and temperate forests, savanas and grasslands, arid zones, wetlands, islands and tundra ecosystems; they are looking at the effects on man and his environment of pesticides and fertilizers, large engineering works, environmental pollution; they are investigating the ecological aspects of urban systems.

They are, of course, best known for Project Area 8, conservation of natural areas and genetic diversity -- the Biosphere Reserve System. The international MAB programme has sparked the establishment of 215 biosphere reserves in 58 countries. These serve as samples of varied ecosystems, and reservoirs of genetic diversity, and will be valuable for future scientific research. They will also lead the way toward natural resources conservation on lands outside reserve boundaries.

In the process of helping to set up and maintain these reserves, MAB scientists have developed an understanding that natural areas in developing countries cannot survive unless they benefit the people that live around them. MAB publications, illustrating examples of integrated development schemes, which both

improve the lives of Third World farmers and at the same time permit conservation of ecologically important reserves, such as forested watersheds, are slowly having an impact on project design. (See MAB After 10 Years, Ecology in Practice: Insights from the Programme on Man and the Biosphere, 1981, for several good examples).

Funding for U.S. MAB: United States participation in the international MAB programme is voluntary, as it is for all nations. Our program has in fact been a good example, for several years, of how government agencies can cooperate on important research work. The National Park Service, U.S. Forest Service, Agency for International Development and Environmental Protection Agency have all at one time or another collaborated on projects of the U.S. MAB. The State Department has provided office space and personnel to coordinate the U.S. program, out of funding for the UNESCO National Committee, in State's budget. Project funding, on the other hand, has been provided as a voluntary contribution from the research funds of the Park Service and Forest Service. In no case has there been assured line-item funding for MAB. This means that the program is particularly vulnerable during times of tight budgets.

The National Wildlife Federation believes that the U.S. MAB program addresses some of the crucial questions facing the human race in the future -- sustainable economic development, sustained-yield agriculture and forestry, explosive growth of cities, especially in the Third World. The United States should not allow funding for this important program to fall through the cracks in difficult

economic times. The Federation feels strongly that both the MAB coordinating office and the project (research) funds should be given line-item funding, at least in part to make possible rational project planning. And we hope that if an appropriate opportunity arises, this Subcommittee would make such a recommendation to the relevant authorization and appropriations committees.

I would add one more comment with reference to MAB funding. As noted above, the MAB program was established in 1971, under the auspices of the United Nations Educational, Scientific and Cultural Organization (UNESCO). That agency was the only UN organization concerned with ecological issues at the time. Thus UNESCO was not an unreasonable choice to house UNESCO, although soon afterward the United Nations launched the UN Environment Program, which might have been a more compatible home for the program. In any event, MAB is still a part of UNESCO, and a victim of the unhappy circumstance that UNESCO is very politicized, over issues entirely extraneous to MAB's concerns. The Federation hopes that MAB's value and scientific impact would be judged on their own merit, and that the program would be viewed as separate from the political intricacies of UNESCO. MAB is valuable in its own right. It is a vital program working for the future habitability of the earth. We feel it deserves the full support of the United States.

UNESCO's Biosphere Reserve Program

At long last, we're planning for the future

BY JIM DOHERTY

FOR centuries, people have pummeled the planet without worrying too much about the consequences. What did it matter that a few rivers, a few lakes, even a few oceans were killed, as long as the benefits of pollution outweighed the losses? What difference did it make if vast prairies and wetlands were turned into farmland, as long as there were hungry people to feed? So what if some rain forests in one part of the world were obliterated, as long as others still stood elsewhere?

Lately, with mankind facing the grim prospect of another population doubling (to around 6½ billion) by the year 2000, the answers to such questions have begun to assume a chilling clarity. In Europe and Asia, in North America and Africa, environmental problems have become horrendously severe. Acid rains ... toxic fish ... poisoned earth ... cancerous air. The message seems simple enough: Move over, Four Horsemen, here comes another rider: Ecocide.

What's to be done?

Several years ago, UNESCO — the United Nations Educational, Scientific and Cultural Organization — set into motion an unconventional idea that may represent one of *Homo sapien's* last, best hopes for a safe and sane habitat. Called "The Biosphere Reserve Program," it is doing something that no other environmental organization has ever done. It is cutting across national boundaries to mobilize an international conservation network.

There are other worldwide conservation efforts, of course, including the United Nations Environmental Program (UNEP) and the International Union for Conservation of Nature and Natural Resources (IUCN). But unlike these, the biosphere reserve program is both action oriented and wholly inter-governmental. It is designed to safeguard massive chunks of geography, the "biosphere reserves," to conserve the genetic diversity within those regions, and to facilitate extensive research.

The word "biosphere" refers to the thin skin of soil, air and water that supports all life on earth. The UNESCO program's basic objectives are to learn how the biosphere works in different parts of the world and to monitor man's impact on it. The aim is not to create a series of international parks that will preserve, intact and for all time, everything they contain. Some biosphere reserves will remain relatively inviolate, but many others will sustain a degree, large or small, of human activity and exploitation. Ultimately, says Tom Gilbert, a National Park Service ecologist who coordinates the U.S. biosphere reserve program, the idea is to "facilitate a rapprochement between man and nature."

As far-reaching as it is, the reserve program is just one aspect of an even more ambitious UNESCO undertaking known as "Man and the Biosphere (MAB)." This visionary scheme for bringing about regional and global scientific cooperation is predicated on the fact that pollution and other environmental problems respect no national boundaries. MAB is encouraging governments that share common problems — a polluted river, for example, or a beleaguered jungle — to mount a common search for solutions. At the same time, MAB is also trying to break down the barriers that have always existed between scientists, sociologists, businessmen and government leaders.

Like many another UNESCO endeavor, MAB is idealistic and unwieldy. But ever since the program was launched back in 1970, a determined effort has been made to focus on specific problems and concrete projects. Thus, MAB addresses 14 "project areas," each developed by an international panel of distinguished scientists, government administrators and scholars. Work ranges from research on the effects of human activities on mountains, islands and other ecosystems to more specific assessments of the impact of various pollutants. One project is considering practical yardsticks for evaluating environmental quality. Another is studying land use conflicts over limited water supplies. But the cutting edge of the MAB program is the biosphere reserve concept.

So far, 27 nations have officially

How does the biosphere work? What are man's impacts on it worldwide? That's what the UN's Educational, Scientific and Cultural Organization hopes to learn from a network of reserves like this one at Hohe Tatern National Park in Austria.

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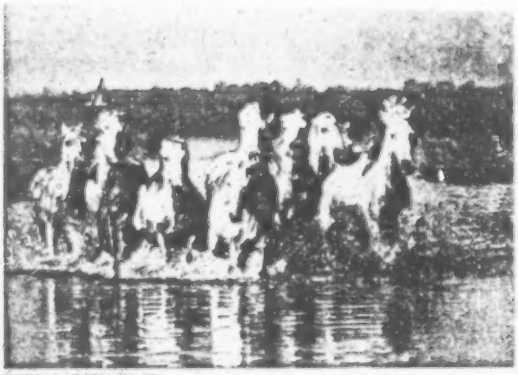
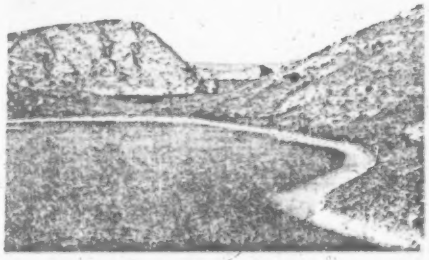
FRANCE

AUSTRALIA



All over the world,

countries are setting aside biosphere reserves to conserve plants and animals . . , and to conduct basic environmental research



IRAN

Lake Rezaiyeh National Park is one of eight designated areas in Iran. While some reserves will remain inviolate, others will be touched by human activity. Research, conservation and education are the goals.

SRI LANKA

Sambar stags in the Horton Forest Reserve may benefit as scientists from many countries swap information and expertise.

U.S. / GREAT SMOKIES

Hardwoods and spruce-fir forests of the Appalachians are part of the rich diversity of Great Smoky Mountains National Park.

Photograph by Jim Amos, Photo Researchers, Inc.

Photograph by Thase Daniel

U.S. / WASHINGTON

The rain forest of Olympic National Park, like each of the biosphere reserves, represents a distinct biogeographical province of the world. So far, 25 areas have been named in the U.S. alone.

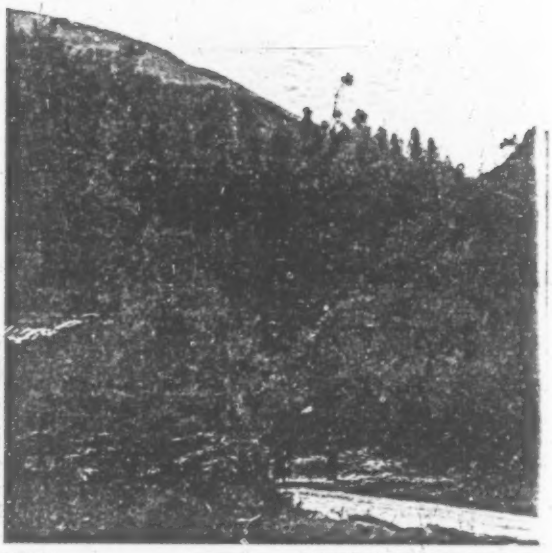
designated 118 areas for inclusion within the biosphere reserve network. Some of these areas are representative of the world's major ecosystems – grasslands, highlands, rain forests, tundra – and they harbor many endangered plants and animals. Other reserves contain unique features of exceptional interest – the hot springs and geysers of Yellowstone National Park, for example, or the phenomenal Ayers Rock in Australia (see page 26). Still other reserves demonstrate the various impacts people have on ecosystems.

The U.S. has been a leader in getting the reserve program off the ground, having designated 28 different areas so far. These range from the Aleutian Islands off Alaska and the grasslands of New Mexico to Great Smoky Mountains National Park in the East and the Everglades in Florida. Some of these reserves coincide with national park boundaries, but others do not. Right now, officials from various state and federal agencies are working together to decide specifically how the areas can best be used as a part of the reserve program.

Once an area has been accepted by MAB as a biosphere reserve, it's up to the nominating country to find enough money to conduct the proposed studies. And there's the rub. Until now, U.S. involvement in MAB has been sustained by "glue money" and personnel from various participating federal agencies, and the State Department has provided office space. (MAB's central headquarters are with UNESCO in Paris.) Sometime between now and early next year, the Administration and Congress must find room for MAB in the 1979 federal budget. Overall, MAB requires about $18 million to get research projects underway, of which the biosphere reserve program would cost about $5 million. Without that modest commitment, Tom Gilbert professes, "we may just have to fold up our tent."

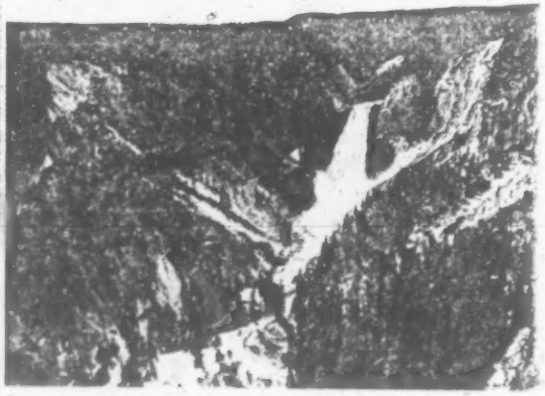
It will be an ironic denouement if the world's wealthiest nation cannot afford to help keep alive the world's only inter-governmental campaign for ecological order and sanity. Stranger things have happened – but perhaps never have the stakes been so high. ■

Jim Doherty is executive editor of INTERNATIONAL WILDLIFE.



PERU
High in the Andes, above, scientists in the Reserva de Biosfera Huascaran and other areas will amass environmental data.

U.S. / YELLOWSTONE
The mountain park with its spectacular scenery and big mammals (also already been studied extensively)



Why we need the biosphere program

BY THOMAS L. KIMBALL

WHEN things go wrong in areas of human design, the cry is always "Back to the drawing board!" Today, with man and the environment locked in an increasingly adversary embrace, this old cry takes on new meaning and gives rise to a new concept: the UNESCO-sponsored MAB program described in the previous article. This particular "back-to-the-drawing-board" movement is powered not by panic or escapism, but by a growing awareness of the fact that we are spending our world too fast.

Although improving the human lot is always our short-term goal, the plain truth is that human habitat is on a crash course with survival. As one species of life after another runs out of living room on our planet, we are at last beginning to question the wisdom of all this speed and even the destination toward which we race. Plants and animals that represent irreplaceable genetic pools are silently slipping into extinction without our even knowing what we are losing.

Suddenly, we need to know. We have dangerously little data about the plant and animal life that is being lost forever as its habitat is destroyed. We know still less about what the absence of that life may mean to us in a future where its genetic potential no longer exists. To spend our world so carelessly calls up the old warning "for want of a nail the shoe..." and then the horse, battle and eventually the kingdom were lost. So it could be that for want of a recklessly squandered gene, a world was lost.

Little more than a century ago the world was ready for the idea of national parks and equivalent reserves. Today's urgent need is to take the next logical step toward preservation of habitat and perpetuation of species. That step is the formation of a network of biosphere reserves. It can become humanity's outpost for the future and a fortress against those who would eat today but leave our children to starve tomorrow.

Whereas traditional parks and reserves are concerned with the preservation of specific plants, animals and wilderness areas, biosphere reserves are concerned with man's use and abuse of entire ecosystems. The overall mission is to maintain the integrity of biological support systems for man *and* nature throughout the whole biosphere. It involves restoration as well as conservation, and the acquisition of new knowledge.

The U.S. MAB program has attracted a group of more than 150 scientists and administrators to serve on its committees and project groups. They represent 25 government agencies, 50 universities, and a number of private organizations, including the National Wildlife Federation. Following the designation of 28 U.S. reserves, a series of workshops has been undertaken. In these, ecological conversions and various government agencies have set detailed research priorities, monitoring, long-term data gathering and training activities. In some cases, joint projects with other countries are being designed.

After one workshop held a year ago, plans for a cooperative monitoring project were formulated by the National Park Service, the Forest Service, Oak Ridge National Laboratory and local universities for the cluster of biosphere reserves in and near Great Smoky Mountains National Park. This project will forecast trends and provide early warnings on environmental quality.

A symposium on biosphere reserves was held in the U.S. and the U.S.S.R. in the Soviet Union last year. It will be followed by another symposium and field trip in the U.S. next year. Technical details for a joint environmental monitoring system will be worked out by U.S. and Soviet specialists at that time.

So progress is being made. And a good thing it is too. For if humanity is ever to set a long-term survival course, it must do so with knowledge of what the natural systems of the earth are built.

In short, we need the biosphere reserve program because the information it provides will help us, in the long run, to survive. That's a pretty good reason for supporting the program. As a matter of fact, I can't think of a better one.

Thomas L. Kimball is Executive Vice President of the National Wildlife Federation.

Mr. MACKAY. So our problem continues to be one of inappropriate homes. No home here or there, and a home in a very politicized, controversial agency of the United Nations.

I am not sure to what extent this subcommittee's recommendations about the United Nations will be appropriate, but I, at this point, don't feel particularly constrained, and so this subcommittee, to the extent it is my recommendations, may just comment about numerous things.

You feel that the scope of the undertakings of MAB to this point, Mr. Rich, has been appropriate? Are you doing anything parallel to what Dr. Baker is doing, sort of an informal oversight?

Mr. RICH. Certainly from the perspective of the environmental organizations that I represent, the MAB focus has been very appropriate. About a third of the 37 research projects that U.S. MAB has funded so far have been concerned with tropical deforestation, and that is a global problem. It is probably the most serious environmental problem of all, because it also involves the destruction of the Earth's biological diversity. Most of the species on Earth or at least half of them are in tropical forest areas.

So, certainly, I think that MAB's focus in the tropical forest and biological diversity area has been appropriate.

MAB has also identified a number of areas in which it is focusing on. They are in my prepared testimony here. MAB is focused on four areas: urban problems, management of humid tropics, ecological humid zones. These are all areas which are crucial for the sustainable growth of the Third World economies.

This is really where the crisis is in the developing world, in the Third World, because people are destroying their resource base on which they have to depend.

Again, this focus of MAB on the link between the baseline scientific research and management of natural areas for conservation and development is an appropriate one.

So from the standpoint of the conservation community, I would say that we are quite happy with MAB's focus.

Ms. BRAMBLE. I would definitely agree, and add simply this, that one of the areas that I mentioned, looking into how reserves can be maintained through interaction with the neighbors of these reserves, people who are always going to be in the vicinity and their cooperation and support and benefit from the reserves is going to be crucial to their continued existence.

These are things that MAB took into account very early and some of the work with Mexico, particularly two biosphere reserves in the north of Mexico, are prime examples of how this kind of cooperation with people outside can be done and is proving extremely valuable as examples for other areas.

Mr. RICH. Another example that might be cited is the activities of MAB in the Caribbean, which was mentioned today, this conference in 1979 on environmental management and economic growth in smaller Caribbean islands.

That brought together for the first time high-ranking delegates from islands, nations, and regions and representatives of development assistance agencies to discuss and plan for ways of achieving sustainable economic growth.

This is something, of course, which predated the Caribbean Initiative or any of the other activities that we are promoting now in the Caribbean. I think MAB, in some respects, is really very farsighted.

Mr. MACKAY. I think they were prophetic, and they are going to prove to be prophetic in the whole island idea. I come from Florida and I see Florida as a Caribbean nation. We are, whether we like it or not, and we are the one that is sort of the pot of gold at the end of the rainbow.

I see the only way we are going to solve this is not with guns or fences, but in some way with a policy that enables people to live with their environment. To me it is enlightened self-interest. I am very pleased to hear you are as far advanced with that as you are.

I would like to summarize what I have seen in this hearing. Of course, the main significance of this hearing will be the written record, which will be forwarded to the committee which will make the decisions.

I see the decision about funding of this program as being crucial. There is a very specific aspect to it, which is the program may simply cease to function if it is allowed to drag much longer. There is also a symbolic, a very significant symbolic dimension to it which would say that either we don't know what we are doing or else we have lost interest in the MAB program which is very important and which our leadership actually began.

I would hope, Dr. Baker, that you can expedite the overview that you are doing, because I would expect that people are going to want the answers to those questions. How do you see it as a person now with a more or less objective view? At least you don't feel called upon to defend what is there now. So your view is objective in that sense.

I would expect you to be an advocate for the program. I would hope that we could perhaps get all of this in place in time so that the committee looking at it would be able to have it evaluated. For my part, I will try to see to it that the record is complete and I will, on a personal basis, make recommendations that we don't keep Mr. Holmes in the position where he has got to choose between his job or the functioning of the agency.

I appreciate very much the participation of individuals in this program. One of the things, on a more philosophical basis, that concerns me is that as our system is evolving, it requires a high-pressure constituency to make programs such as MAB work. It bothers me that here is a program which is as important as any I know of for the future of the world ecology and environment which seems to be floundering because its constituency, perhaps, has other priorities and has not seen this as a very important priority.

What we have got to do, somehow, is to create the constituency or develop a constituency that will see to it that this small but very important program is continued.

Let me thank all of the witnesses for being here and for your help and thank all the others who participated.

We are adjourned.

[Whereupon, at 4:41 p.m., the subcommittee was adjourned subject to the call of the Chair.]

APPENDIX

Additional Material Submitted for the Record

STATEMENT ON THE MAN AND THE BIOSPHERE PROGRAM OF UNESCO AS SUPPORTED BY THE US DEPT. OF STATE

Prepared as testimony for the Subcommittee on Natural Resources,
Agricultural Research and Environment Committee
on Science and Technology
U. S. House of Representatives
Washington, DC 20515

My name is William M. Upholt, I was granted a Ph.D. in Entomology by the University of California at Berkeley in 1939. Most of my career was devoted to research and research administraiion on the control of insect pests and on the hazards of pesticides, as an officer in the U. S. Public Health Service. The last seven years before my retirement in 1977, I was employed by the U. S. Environmental Protection Agency, as Deputy Assistant Administrator for Pesticide Programs, Science Advisor to the Assistant Administrator, and finally as Chief, Health Effects and Science Policy, on the staff of the Assistant Administrator for Pesticides and Toxic Substances.

I was appointed to the Directorate #9 (on Agricultural Chemicals) of the U. S. Man and the Biosphere Program in about 1975 when it was first established and have continued to serve on it since my retirement.

The Subcommittee has heard excellent testimony on the MAB Program and its objectives and operations, so I will limit my statement largely to a joint project of Directorates #9 (Agricultural Chemicals) and #13 (Environmental Perceptions). This particular project has as its objective a better understanding of how farmers and others concerned with pests understand the hazards associated with pests and with their control, especially by use of chemical pesticides. The project was first proposed by a group of geographers attending a meeting of the International Geographical Union held in Ibadan, Nigeria in 1978. They called a meeting of interested scientists to be held at Cambridge University in England in 1979. At that meeting the general outline of the needed research was agreed upon and a follow-up meeting to develop research protocols was called for Oct., 1980 at Clark University, Worcester, Mass. At that meeting detailed research protocols were developed for four studies involving such things as a profile of agriculture and other activities in which pests are important, how pests are recognized and controlled, the flow of chemical pesticides into the country, how pesticides are regulated and used and what happens to the residues and wastes; also they asked for some descriptions of successful (and unsuccessful) attempts at integrated pest management.

Each of these projects are to be done by residents of the country involved so that they will be able to take into full account the cultural affects on perceptions and responses to inquiries.

Preliminary reports were called for at a conference held in Nairobi, Kenya, in June, 1982. A preliminary report on this meeting is attached to show progress being made on the project.

This project meets most of the objectives and emphases recommended by International MAB. It is interdisciplinary, involving joint efforts of both social and natural scientists (and sponsored by two different Directorates of MAB); it is international with especial emphasis on countries south of the equator (a majority of the participants are countries south of the equator but a significant number are north of the equator including Great Britain, Canada, U.S.A., West Germany, and Mexico); the costs of the research are largely paid from sources within the country where the research is being done; and of course the results are expected to result in reduction of adverse effects both to human health and to the environment.

The project is sponsored (or endorsed) by not only MAB but by the International Geographic Union (Working Group on Perception of Environment) and International Organization for Biological Control. The US MAB was directly or indirectly responsible for financing in part the attendance at the Cambridge (England) and Clark University (USA) meetings.

Unfortunately they were unable to send any one to the Nairobi meeting but US AID was represented and two faculty members of Clark University were on detail to Nairobi at the time and contributed to the planning of the meeting as well as presenting papers.

The encouraging reports made at the Nairobi meeting would indicate that this project will contribute greatly to the understanding and use of pest control techniques in less developed countries and should improve pest control as well as reduce hazards to both humans and their environment. The US AID Program of the State Department has also conducted a number of important training programs throughout the Southern Hemisphere, dealing with Integrated Pest Management and avoidance of health hazards from pesticides (this was also a project of US MAB Directorate #9). Its effectiveness surely will be enhanced by the better local understanding of pests and their control that should result from the local research on Perception of Pests and Pesticides.

In addition US MAB #9 jointly sponsored with AID a Strategy Conference on Pesticide Management held at the Department of State in June 1979. This was attended by participants from UNFAO, UNWHO, UNEP, Dominican Republic, Colombia, Peking (China), the Philippines, Surinam, Kenya, and Guatemala, as well as USA. It contributed significantly to the way in which US agences can be helpful to other countries of the world in dealing with their problems with pesticides.

Hopefully US will be able to continue their participation on these and other MAB projects around the world. These examples indicate the great benefits that can accrue to developing countries from research that they do themselves with minimal support and encouragement from the MAB efforts of US and other industrialized nations. Certainly the relatively low cost to the US government of MAB Programs is very well invested.

PERCEPTION AND MANAGEMENT OF PESTS AND PESTICIDES

Newsletter No. 7 9th July 198?

Nairobi Meeting, 21st - 25th June

The PMPP meeting in Nairobi last month was a great success from academic, organizational and social points of view. I'm sure I can speak for all participants at the meeting and extend our thanks to Dick Ford and Abe Goldman for organizing things so efficiently in Nairobi, and ICIPE and the staff of Duduville Conference Centre for making out stay such a pleasant one. I had feared that the name "Duduville" (dudu = insect) might bear some relationship to the night-life of the place, but this turned out not to be the case. (However, some of us occasionally felt that we would cheerfully swop the frogs for a few mosquitoes).

Participants at the meeting were as follows:-

Dr. D. Atteh	-	Illorin University, Nigeria
Dr. M. H. Birley	-	Liverpool School of Tropical Medicine
Dr. D. G. Bottrell	-	University of California
Mr. D. Bull	-	Oxfam (Public Affairs Unit)
Dr. I. Fagoonee	-	University of Mauritius
Dr. Farah	-	United Nations, Nairobi
Dr. R. Ford	-	National Environment Secretariat, Nairobi
Dr. J. J. Gaudet	-	USAID/REDSO, Nairobi
Mr. A. Goldman	-	National Environment Secretariat, Nairobi
Dr. K. L. Heong	-	Malaysian Agricultural Research & Dev. Inst.
Mr. C. Juma	-	Environment Liaison Centre, Nairobi
Mr. D. Kinyanjui	-	National Environment Secretariat, Nairobi
Mr. M. L. Kirui	-	National Environment Secretariat, Nairobi
Mr. S. Muchiru	-	Environment Liaison Centre, Nairobi
Dr. J. Mumford	-	Imperial College, Ascot
Dr. B. Napompeth	-	NBORC, Bangkok
Mr. J. Nyamu	-	Ministry of Health, Nairobi
Mr. F. I. Okanga	-	Ministry of Water Development, Nairobi
Mr. J Omwenga	-	Ministry of Water Development, Nairobi
Dr. M. W. Service	-	Liverpool School of Tropical Medicine

Dr. R. Traboulsi	-	Food and Agriculture Organization, Rome
Dr. E. Tukahirwa	-	Makere University, Uganda
Dr. B. G. Waiyaki	-	UN Environment Programme, Nairobi
Dr. I. H. Zaidi	-	University of Maiduguri, Nigeria

The following papers were presented:-

D. Atteh	-	"Nigerian Farmers' Perceptions of Pests Pesticides"
M. H Birley	-	"Pest Perception in Sukumaland"
D. Bull	-	"Pesticides and the Third World Poor - International Action by Non-governmental Organizations"
I. Fagoonee	-	"Mauritius - Pests, Pesticides, Pesticide Legislation and Management"
A. Goldman & D. Kinyanjui	-	"Kenya National Profile"
K. L. Heong	-	"Pest Control Practices of Rice Farmers in Tanjang Karang, Malaysia"
J. Mumford	-	"Perception of Pests in Pest Management"
S. Napompeth	-	"Thailand National Profile on Pest Management and Related Problems"
M. W. Service	-	"Problems of Vector-borne Disease on Irrigation Projects"
J. Tait & R. Garland	-	"Pesticide Usage on Arable and Brassica Crops in the UK"
E. Tukahirwa	-	"Uganda National Profile"
I. Zaidi	-	"Farmers' Perception and Management of Pest Hazards: a Pilot Study of a Punjabi Village in Lower Indus Regioan"

The following papers were also sent to the meeting, although their authors were unable to attend:-

T. Abrahamse	-	"Pesticide Inputs and Patterns of Pesticide Usage in Zambia with Special Emphasis on the Role of Multinational Companies"

C. P. F. de Lima	-	"Socio-economic Survey of Post-Harvest Methods and Problems in Swaziland"
S. M. Dellow	-	"Exposure to Pesticides in the Farming Community: Risk Perception Attitudes and Behaviour"
D. Pimentel & D. Andow	-	"Pest Management and Pesticide Impacts"
P. T. Walker	-	"The Importance of Measuring the Economic Impact of Pests, Diseases and Weeds in the Perception of Pests and Pesticides"

This collection of papers will make very interesting reading and provide a wealth of background data for all who are involved in the control of pests and of those who produce, distribute and use pesticides. We are currently looking into various possibilities for publication. The ideal outcome would be publication as a special issue of "Insect Science and its Application", Editor-in-Chief, T. R. Odhiambo, ICIPE.

In addition to the prepared papers, the following presentation were made:-

D. Bottrell	-	"The Role of Governments in Pesticide Use in Third World Countries"
R. Traboulsi	-	"UNDP/FAO Action Programme for Improved Plant Protection"
B. Waiyaki	-	"UNEP's Role in the Management of Pests and Pesticides"

(Heong Kong Luen also brought to the meeting a copy of Malaysian Plant Protection Society (MAPPS) Newsletter, which he edits. Of particular interest is a report, including abstracts of papers, on the International Conference on Plant Protection in the Tropics, held in Kuala Lumpur on 1st - 4th March 1982. The newsletter can be obtained from PO Box 2351, Kuala Lumpur 01-02).

Research Funding

One of the most encouraging outcomes of the meeting was the expression of interest in funding research projects by representatives of UNEP, FAO and USAID. There is also a possibility that the US National Research Council Board on Science and Technology for International Development (BOSTID) may, in the not too distant future, fund projects in this area.

All this is for research in developing countries. Those who wish to work in developed countries are unfortunately still at the mercy of their own national funding organizations.

I would be happy to advise those of you who would like to apply for financial support on where to send the application if you can let me have a copy of the research proposal.

Future Plans

The final session of the meeting was devoted to a discussion on the strengths and weaknesses of the PMPP research programme to date, and the provision of remedies for the weaknesses.

Four major research areas were identified at the Massachusetts meeting in 1980, and are described in detail in PMPP Guidelines for Research, ed. J. Tait (Pub. No. EPR-8 obtainable from Publications and Information, Institute for Environmental Studies, University of Toronto, Toronto, Canada M5S 1AH). Of these four areas, "Pest Managers and Pesticide Users" and "National Profiles of Pesticide Production and Distribution and Pest Management Practices" appear to be generating a considerable number of research projects. "Case Histories and Alternative Pest Management Systems" and "International Flow of Pesticides" have so far been less productive, although they are far from moribund. We hope that the continued involvement of Mike Service and Martin Birley of the Liverpool School of Tropical Medicine will fill a gap in the study of public health aspects of pest and pesticide management.

As participants' expereince in actually carrying out research projects as part of the PMPP programme has increased, several points have emerged which need greater emphasis.

1) It is important to ensure that the various research areas identified do not become too rigidly compartmentalized. They each have areas in common with other components and this should be recognized so as not to inhibit research workers. It is particularly important that the areas of public health and agriculture should not be divorced from one another. Agricultural practices often create public health

problems, or public health problems constrain agricultural practices. The recognition and assessment of the importance of these interactions is essential.

2) The membership of PMPP is very interdisciplinary and ideally, within any one country, a research project should have inputs from research workers in biological sciences and in geography or the social sciences. However, we recognise that this is not always possible and some people find that their background in some aspects of their research needs to be reinforced. To provide assistance under these circumstances, Joyce Tait, David Atteh, Martin Birley and John Mumford will form a Research Methods Panel, to correspond with people who would like to help with the planning, conducting and analysis of research. Participants felt that greater effort should be made to achieve standardisation of research methods among projects in different countries also that a more rigorous approach should be adopted to defining the aims and objectives of a project at the outset. We hope that the Research Panel will help to achieve this.

3) US-AID has an Update Information Service which is available free to third world collaborators. This gives access to machine-readable databases for literature research and AID will send out photocopies of articles requested. For further information, you should go to your local AID headquarters. If that is not possible, contact Dale Bottrell at CICP, 2288 Fulton Street, Suite 310, Berkeley, California 94704, USA.

4) Specific project areas in which participants expressed an interest as a result of discussions at the meeting were:-

the issue of suicides attributable to pesticides, and why people use pesticides for this purpose (it is important to know what proportion of the pesticide poisoning problem is attributable to suicide);

the disparity in the pest and pesticide perceptions of farmers and of extension workers;

the impact of advertising on pest and pesticide perceptions.

5) David Bull is setting up a documentation centre on pesticide advertisements and labels used in developing countries with the aim of improving standards. He would be grateful for any examples which you can send to him (see address list). He is also attempting to monitor the incidence of pesticide poisoning. If anyone has any data on this, would they please pass the figures on to him.

6) The next meeting of PMPP will take place in Chian Mai, Thailand, in about two years time, to report on further progress on research projects. The theme of the meeting will be "Socio-economic and Political Aspects of Pest Management". Banpot Napompeth has kindly agreed to undertake the organisation of this meeting.

7) I'll sign off with a couple of those famous "laws" which always sound so seductively true:

Harvard Law: Under the most rigorously controlled conditions of pressure, temperature, volume, humidity and other variables, the organism will do as it damn well pleases.

Lubarsky's Law of Cybernetic Entomology: There's always one more bug.

Best Wishes,

Joyce Tait

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